OF JOHN HENDLEY BA
JHB

PRO SCIENTIA SALUTE POPULIQUE
LIBRARY OF
THE NEW YORK BOTANICAL GARDEN
Barnhart Library
Purchased
1926
Septemb 1899 R.W. Gibson Invt

ARCHIVES OF SCIENCE

AND

TRANSACTIONS

OF THE

ORLEANS COUNTY SOCIETY

OF

NATURAL SCIENCES.

EDITORS:

J. M. CURRIER, M. D., Newport, Vt.
GEO. A. HINMAN, M. D., West Charleston, Vt.

VOL. I. OCTOBER, 1870. NO. I.

Incorporated Nov. 10, 1869.

PUBLISHED QUARTERLY
BY J. M. CURRIER, M. D.
NEWPORT, ORLEANS CO., VERMONT.
TERMS, $2.50 PER ANNUM, IN ADVANCE. SINGLE NUMBERS 75 CENTS.

XA
.R4826
v.1

PRINTED AT THE FRANKLIN PRINTING ESTABLISHMENT,
NEWPORT, VT.

LIBRARY
NEW YORK
BOTANICAL
GARDEN

ARCHIVES OF SCIENCE.

Vol. I. OCTOBER, 1870. No. I.

ON THE CHARACTER AND CUSTOMS OF THE PAWNEES,

By REV. T. E. RANNEY, of Holland, Vt.,*
(POST OFFICE ADDRESS, DERBY LINE, VT.)

Read before the Orleans County Society of Natural Sciences, July 12, 1870.

JAN [illegible]
Barnhart Lib.

From the time of the first discovery of this continent, the inhabitants of the other have always manifested a great degree of interest in the occupants of this. Princes have left the abodes of civilization and refinement, and followed the savages in their roamings over the prairies, and have returned and reported to their people tales of hardship which are scarcely credited. But with our own people a much larger interest seems to be felt in the barbarous nations of the old world, than in their not less barbarous neighbors on this side of the water. There are many more travellers from France among the western Indians than from the United States. The French language is used more in the Indian country than English. If you would obtain an interpreter in the Indian Territory, it is always necessary to get one from the French. The customs and habits of most of the tribes have undoubtedly been much modified by their intercourse with the French people, who have been among them both as traders and travelers. I am convinced that their religious views are in some measure shaped by the superstition of the French Roman Catholic population, with which they have become acquainted. But to all, whether French or English, they present many interesting topics of enquiry. Those who are farthest removed from the borders of civilization, are living the simplest life in which it seems possible for man to subsist. If the sentiment of the poet expressed with so much beauty

---

*Mr. Ranney was missionary among the Pawnees three years, and among the Cherokees fourteen years. We think it would be desirable if Mr. Ranney would prepare a grammar of the latter language.

"Man wants but little here below,
Nor wants that little long,"

be true any where, it is emphatically so of the native inhabitants of our western prairies. It requires but a very little to meet all the wants of a barbarous people, and it may well be doubted whether a great proportion of the wants of man in civilized life, are not rather imaginary than real. Many of those things we call luxuries and perhaps some we call necessaries, are but passports to hasten our journey to the tomb. Civilized man, with all his boasts of improvement in his mode of living, is not capable of enduring fatigue like one he calls savage, and who is content to dress in the skin of the buffalo, to live in a rude wigwam, and to cook his food by the offal of the wild beasts. The woman of civilized life would instantly break down under a tithe of the hardships of her sister in a barbarous state. After all we cannot recommend the life of a savage. With all its advantages, savage life has no charm for me. I know that many would tell us, and some who have tasted the bitter and the sweet of savage life, that it has the advantage in the scale of enjoyment over the civilized, but such is not my opinion.

In order to be able to judge on this point we must know what the life of a savage is. My object at the present time is to impart some information in regard to the life of the North American Indians. My remarks apply principally to the Pawness as they were more than twenty years ago, when I resided with them for about three years. What facts I propose to give, were derived from personal observation. In some respects I was not so favorably situated to learn all their customs and manners, as some others. My object was not so much to enquire of them, as to teach them. To acquire their language and to give instruction, required all the energies I could command. The time allowed me at present, would not be sufficient to give all that would be necessary to a perfect understanding of the chequered life of those wild men, "the Arabs of the prairie," as they were often denominated. It would require an ordinary sized volume to do them justice. But let us occupy faithfully what time we have.

Were we to be introduced into the midst of an Indian village, for they live in villages, a great many enquiries would instantly arise about what we should see. Nor should we be very particular about the arrangement of our questions. Every thing about us would be strange and unaccountable. Our attention would be directed to a thousand things, in relation to which we should wish to be informed. But let us first direct our attention to the house or, as we have learned to call it, *lodge*, we are about to enter. Its external appearance is as much like a coal-pit of New England, as any thing we can compare it with. A hole is open in the centre of the top from which proceeds smoke. Around that hole are men standing taking observations; perhaps gazing at us or perhaps watching with interest some games or some medicine performance. Here is the entrance, invariably facing the east or sun rising, so that in their language the name for the east, or the place where the sun rises is in front or before us. To enter, we first go through a hall or passage way some four or five yards long, scarcely high enough to walk erect. The outer end of the passage way is generally open. If it is the lodge of much of a warrier, there are hanging near the entrance a spear and shield, with a string of scalps of their enemies. The passage way is covered like the rest of the lodge, first with sticks of willow, then prairie hay, and lastly, dirt a foot or more in thickness. The passage is smooth, well trodden, scarcely wide enough for two to walk abreast comfortably. At the inner extremity of the hall we come to the door, which is simply the skin of some animal stretched with small sticks and loosely suspended from the top by a string. We raise it easily and are welcomed most heartily from within, and are invited to the opposite side of the lodge, where is the most honorable seat. We find none of the household furniture of civilized life. The seat given us is a mat of rushes, unless they happen to be a little better provided than the commonality, and may have a pillow of hay from the prairie. But if we are choice of our dress, we must mind how we sit upon their cushion. If it is not well oiled, it is likely that it is covered with vermin. But we must learn not to fear such small inconveniences. Here is no place to give vent to our feelings in favor of a nicely cushioned "old armed chair." Such are not found; we have left them far behind us; we look about us for the comforts of life; we see no modern cook stove, but there is a place in the ground, in the centre, slightly dug out for a fire. Here is a fire of dry limbs or by chance of the dung of the horse or the buffalo. There is no stove-pipe or chimney to convey the soot and smoke. The whole structure constitutes the chimney, only there is a hole at the top for the escape of the smoke. But our eyes soon become witness that smoke does not all ascend directly heavenward in such a dwelling. There is nothing like habit, and we soon find ourselves habituated to dust and ashes, and now it is no evidence of humility. Pride dwells in such an abode as this. On each side of the fire a pole is set in the ground, which inclines over the fire to permit kettles to be hung upon them. Some of these they have obtained from their intercourse with civilization. Perhaps now a brass kettle of the capacity of some eight or ten gallons, is hanging over the fire, filled with sweet corn or beans or the dried meat of the buffalo. If it is in the fore part of the day, we need not expect to be treated to the contents of the kettles; these are not served till near night, until they have been cooked some four or five hours. This is for the evening feast. Besides this large brass kettle there are probably small ones of sheet iron or tin used for the same purpose. Here by the fire are unfinished bows seasoning for use. These are more usually made of hickory wood, or if they have been fortunate enough to obtain one, they prefer the *bois d'are.* We now look about for other articles, useful and ornamental. We see no bureau or chest of drawers; no cupboard with a costly set of china or glass ware. We may perhaps see on one side of the room some tin cups, with a supply of spoons made of the horns of the buffalo. We may see some muskets with the powder horn and the bullet or shot pouch hung up in one place, and there is the inevitable well-strung bow and the quiver full of arrows. These are made of round reeds or small sticks headed with sharpened iron, and well heeled with feathers of the hawk or the eagle.

We may be weary and wish to retire; we look for another room, but there is none. With them this would be superfluous. To rest they lie on the rush mat near the fire, or sometimes there is a couch against the outer wall raised some foot and a half from the ground, and supported by willow-sticks running from a forked stake to the back side of the lodge, made up with a buffalo robe or two spread over the sticks, and if a covering is desirable there may be an additional robe or a deer skin or two, or dearly bought blanket, and sometimes they have a curtain of willow work, which they suspend in front of the couch, which serves to keep off the gaze of the curious. There is a noise on the top, and we think of the men we saw standing upon the roof, and perhaps fear it may cave in. We look for the supports. There are pillars arranged in a circle around the fire. These are not wrought according to any class of architecture with which we are acquainted, but are more natural, they are simply forked sticks, perhaps deprived of the rough bark; these are the supports of the roof, and usually there are two circles of them between the outer edge and the centre or fire place. To these posts are hung various implements of war, as the lance, the war club, and the shield made of the thick skin of the buffalo. The inhabitants of the lodge if at home are variously employed: the women and girls may be pounding corn in a rude mortar, one end of which is sharpened and driven into the ground near the door; the pestle is large enough to require the strength of two women, which would equal the strength of four ordinary women with us. In another part some are dressing robes or deer skins, though this is more commonly out-of-door work. The children, as naked as born, unless it be with some addition of dirt, are perhaps engaged in some games of chance or of skill. There may chance to be a young man that is engaged at the *toilette*—plucking out his beard or eye brows, or having the head shaved and besmeared with paint according to the most improved fashion. A tuft of hair is left for the scalping knife, which extends down the back, and perhaps it is deficient in length and he has it lengthened *a la mode*, with the addition of some of the horse's mane or tail braided on the end. Our immediate company are engaged around the fire smoking the long pipe, and at the same time engaged in acts of devotion. There is something singular in this ceremony worthy of our particular attention. The head man takes out his pipe and tobacco pouch, which is the head and skin of a polecat, and hands it to his neighbor, who receives it and examines it with care to see whether the passage through the long stem is clean, and then cuts and rubs the tobacco in his hand, mingling it with the dried leaves of the sumach lest it have too great strength; then after a peculiar invocation to the deity fills the bowl of the pipe made of a red kind of stone, and draws his hand carefully across the stem and again asks God's propitious care. He speaks to some boy or girl to reach him a coal of fire. When the pipe is fairly lighted, he presents the stem to the mouth of the owner, who draws in a mouthful of smoke and raising his face toward heaven, he lets a cloud of incense rise with a prayer to my father above, then draws another mouthful and blows it earthward, and prays to my mother beneath, and then four more, first to the east, then south, west and north, at each of which he utters a prayer to that wind; to my uncle to be favorable and kill my poverty; after an additional whiff or two the officiating priest still holding his pipe in his hand, presents it in a similar manner to the next, who goes through with the same incantation of apparently sincere devotion, and then he passes it to the next to the end of the company; each praying in his turn to the same deities, giving them the same appellation of relationships. When the fuel becomes exhausted the one who filled it goes through an additional religious ceremony, and clears out the bowl and the stem of the pipe, and returns it with the tobacco pouch to its owner, and the prayer meeting is closed.

Now perhaps an invitation arrives to go to a feast, and it is expected that the guests will go immediately. The messenger takes us to another lodge, similar in all respects to the one we have already left. We are obliged to follow close or we might lose the way, there is such a similarity among the lodges that we can scarcely distinguish one from another, and their is no regularity in their position. Now a lodge and now a horse pen, of willow poles stuck in the ground near each other, large enough to contain ten or a dozen horses closely huddled together. On the way we shall probably hear the harsh voice of the public crier, who is an old man sent about the village to announce the news of the day. Listen and catch the sound. We cannot tell what he says. It seems like one continued vowel sound: A r-a-a, with no sense to us. It requires a large acquaintance with the language to be able to understand the crier. But this is their daily paper, and all the news that concerns them is made known by his voice.

They are always at war, and are eager for the war news. If a war party of the enemy have been seen, or if one of their own is returning from a successful or an unsuccessful forage, it all has to be announced in public on the orders of the chiefs which must be obeyed. But we have come to the feast and are seated with others. If a white man is invited, he must be honored with the highest seat beside of the master of the feast. Feasting is a great institution with them and when they have plenty, is indulged in to great excess. A friend who had been with them several years remarked, that he had been called up after retiring for the night, and invited to attend a large number of feasts. The food is dealt out unsparingly when it is plenty. Dried meat of the buffalo is the most common entertainment at these feasts; it is dried without salt, and is eaten without or sometimes with boiling. When eaten without they generally supply a piece of lean and a piece of fat to be eaten together like bread and butter, and all the guests are expected to eat or carry away all that is set before them. If perchance any thing is left behind it will be sent after them to their home. At these feasts they are sociable, and call for speakers as do more civilized men. They are very fond of teaching strangers the use of their language, and will request them to speak and write out their names, which is a very difficult matter to do on account of the length of their words. The longest word I learned to speak readily was their name for a button, which to use properly required the use of some ten or twelve syllables, and they seemed to have no idea of dividing any word into syllables, but pronounced it as hastily as possible for us to write.

But one needs to take a look at their village to estimate their character and habits. At the main Pawnee village there were probably something more than two hundred lodges, such as has been described. The largest lodges often accommodate as many as fifty, but probably would not average more than thirty to a lodge. The lodges are placed within a few feet of each other, often scarcely leaving room for a path between. In such villages there is of course much filth, and they become very unhealthy if they remain a great while in them. But in a certain part of the village we may observe a collection of men, and the tops of the lodges in that vicinity seem to be covered, and we wish to know the object of attraction. It is probable there is a grand medicine performance, by which term is indicated a sacred performance of some kind or other. Their medicine men are jugglers who perform various tricks, which are mysterious to the multitude. Hence any thing that is marvellous or mysterious is what is styled medicine. This medicine performance is considered with them a religious ceremony, and consists in rattling a sacred rattle, and in certain mysterious movements or dances. The performers are clothed in a sacred dress too pure to be polluted with the touch of a woman. A part of the performance is to swallow long sticks; to run large knives down their throats, which are drawn out covered with blood. This is a specimen of a religious performance among the North American Indians. Sometimes they set themselves up as marks to be shot at with arrows, and with guns loaded with powder and balls. Such things are done in the name of religion. I have seen them practiced till the heart was sick with beholding. As near as could be ascertained they hoped by these rites to appease the anger of the God they thus worshiped; and often I was told they died in the performance. This is heathenism, a sacrificing to Moloch. I need not to stay to point out its absurdity and folly. The heart sickens even at the recital of such abominations, and we will turn away from the scene. As to their knowledge of medicine they really have as little as of religion. We are invited to visit a lodge, where one is sick with a fever; we are white men and it is supposed of course by them that we can give medicine to cure the sick. But our enquiries are now to ascertain what they would do. We have seen many a handbill recommending various medicines, because it is said it was in use by the Indians, who are supposed by many to understand all medicine and to be able to heal all the sicknesses of the people. Nothing could be a greater evidence of quackery. I do not profess to know that all the tribes of Indians were as ignorant of these things as were the Pawnees, and yet I know nothing that would indicate that any knew more. If the knowledge which the Pawnees had acquired from the whites was taken away, there would be none left. Their medicine like their religion is but a bundle of superstition consisting of charms and jugglery. They are easily imposed upon and made to believe in almost anything hidden and mysterious. They can be made to believe that a peculiar medicine is beneficial, as many in civilized life can; they do not, so far as I could learn, administer any medicine to affect the system. It is doubtful whether they know of any thing that would act as a cathartic. For an emetic they seemed to know that tepid or warm water would promote vomiting, but it is doubtful whether they had not learned this from the whites. Some of them could at times produce vomiting by the use of a feather run down the throat. It was not known that the Pawnees ever drew blood intentionally as a remedy. Some of the neighboring tribes did, but it is probable they learned to do so from the whites. Indeed the Pawnees had learned that the whites sometimes did and supposed it to be a panacea, and if they were ever ill when white men were about who would bleed, they were wont to resort to them with the request to be bled. I frequently saw the manner of cutting themselves practiced by two other tribes, the Omahas and Otoes to produce blood. They usually bleed somewhere about the head, and to do it shave the hair from the part, often on the temples, sometimes on the top of the head and then take a large knife and hack the skin up in a horrid manner over a spot perhaps as large as a dollar, and then place over the wound so made the larger end of a cow's horn, and with the mouth and lungs exhaust the air at the other end so as to cause the blood to run, till they have accomplished their object and removed the seat of disease. It was thus these tribes practiced in removing fevers. But not so with the Pawnees. Their doctors would take a different course; they would puff and blow all over the patient with the mouth in order to cool off the fever, and instead of dieting according to the rules of our physicians they would set before the patient all the tempting viands in their reach. Their philosophy is that while he can eat he will live, and if he does not eat his allowance he will die. Hence it seemed to be almost useless to give medicine to a Pawnee sick with a fever. If the fever is once broken, and the patient begins to recover, his appetite comes like an armed man and it is useless to tell him he must not gratify that appetite. His maxim is eat or die, and the *fact* generally is in such a case eat *and die.* Their eating is not such as is required to sustain a weakened frame, but such as a sickly appetite demands. Perhaps their practice in cases of fever is most erroneous, but we saw more of this because "chills and fevers" were first introduced among them when we were there. But they did not seem to understand the nature of any disease. They can perform no surgical operation with safety. In cases of accident they cannot take up an artery. Their diseases in their simple life are all of a simple kind, and they seem to have no complex diseases among them. Their practice at an *accouchment* is simply the rattling of a gourd, a child's rattle. I have lately seen a medicine advertised to cure the tooth ache, which was said to have come from these same Pawnees. A more contemptable imposition could not well be practiced, as they were never subject to any disease of the teeth. An anodyne for the tooth ache or a vermifuge obtained from them would be alike worthless, they having no use for either.

But enough as to their medicinal practice. Let us take a view of their habits abroad. Their village is built on the banks of a stream. They always build thus both for the purpose of a supply of water and wood, which grows only upon the banks of streams in their country. The village where they resided when we were there, was situated on a high bank of the south fork of the river Platte. This is a wide shallow stream, generally exceeding a half mile in width, almost always fordable. The only obstacle being found in the bottom which is a sort of quicksand, and the current of the stream is constantly changing, and often to ford it, it is necessary to follow a sand bar in the middle of the stream some distance up or down in order to get across. If we go out to the bank we may see people crossing on foot, the women generally loaded with a burden upon the shoulders or head. These burdens are loads of wood or hay on poles for their buildings. The men will be more likely to be riding on horseback. The women are hewers of wood and carriers of water. An Indian woman's lot is a hard one. If there is any drudgery to be done, it must be done by the women. She builds the house, cuts and backs up the wood, digs up the ground, plants, hoes, and gathers in the corn, dresses the meat, robes and skins, packs and unpacks, saddles and unsaddles horses. When the man rides the woman generally walks and carries a large burden besides. If we look across the stream, we see them coming home or going out, and probably the distance, by the way they travel, a mile or more, and yet we can see women laden with a burden of wood, which one might suppose would break their backs, oftentimes up to their middles in water and sand, and this is the enjoyment women have in savage life. We have heard of their amusements. Is there any thing to alleviate their hardships? The women seem to have no amusements unless it be to get together and dance around the scalps of their enemy, and it is not much better with the men. They have more leisure, it is true, but it is doubtful whether they have more enjoyment. Their amusements consist principally in gambling by themselves, and in the war and medicine dance. They have no amusements fitted to elevate their minds and render them truly happy. If the brute beast can enjoy more than the man of mind, then can the savage enjoy more than the civilized man. Not that the Indian has no more intellect than the brute beast. They show in various ways that they have minds capable of cultivation, and there is no reason why they could not be as intellectual and moral and happy as any race of men. To be satisfied on this point one only needs to attend a council of their chiefs, especially when they meet with the chiefs of other nations or with the agent of the United States. They often delight to enter into a discussion in relation to general principles, when they often show as much of tact and art as their more cultivated opponents. Their minds are not cultivated in schools or academies, and in some respects they are but children of a larger growth. The state of their language would indicate that they were a rude people living in primitive simplicity. They of course have no names to apply to most of the objects of civilization. In their uncultivated state they seem to be remarkably deficient in the science of numbers. They are incapable of performing the simplest problems in either of the fundamental rules of arithmetic. It is difficult if not impossible for them to count a large number. Their method of counting is easy. Instead of enumerating by tens as almost all nations do, they enumerate by twenties or as they term it by men. A man has twenty fingers and toes, and hence twenty is a man, forty is two men, sixty three men, and so on as far as they can count at all.

They have no records, hence no history running back further than the present or last generation. They have no method of computing time except by days or *nights* or what is more usual, by sleeps, moons and seasons. They have only twelve names for the different moons, and every year have great contention as to which moon the present one is. Some of the names of the moons are derived from the constellations in which they exist. In relation to them there is no difficulty as to name. Others have their names from some circumstances in relation to it. As in the spring they have the name for one which they call the wind moon, from the circumstance that during that moon the wind usually blows hard. This comes usually in the month of March, though the month of February is often as windy as March, and this is the time of their difficulty to determine the name of the moon. They have also the green corn moon which is not always so well defined as some. They have two seasons each year, one the summer the other the winter. Their habit of going to the hunt twice in the year probably gave rise to this division. Twice in a year they all leave their permanent village and go forth in search of the buffalo. They usually start on their summer hunt about the first of June, and are gone till August, when their corn is ripe and they return to take care of it. Their women raise considerable quantities of corn, and are very busy from the time they return to their fields in August till sometime in October, gathering in the corn and drying it till spring. When it is sufficiently dried they store it away in cellars, or as they are termed *caches*. These are holes dug in the ground, at the top scarcely large enough to allow of the entrance of a person, but after digging some two feet they gradually enlarge the opening, until it comes to be perhaps twenty feet in diameter and perhaps ten feet deep. Here they hide every thing they do not wish to take with them, placing a quantity of prairie hay around on the outside. They cover it so nicely that it cannot well be found by their enemies, and sometimes so that it is difficult to find it themselves. When their effects are stowed away, they usually start on their winter hunt sometime in October, and travel at about the rate of ten miles a day. When traveling scouts are constantly on the look out for the enemy as well as for the game. Buffaloes wander in immense herds over the prairies, and if one is seen others are supposed to be near and generally are. It is from these the Pawnees mostly derive their food and raiment. They dress in their skins and when they are travelling make of them their temporary tents or lodges. Of their horns they make spoons, of their sinews strings for their bows, and formerly used their shoulder blades as hoes and spades for digging up the ground and cultivating their corn, and probably used them in the place of axes to get their wood. In killing their game they prefer the bow and arrow to any thing else, usually shooting from on horseback. They are much more expert with the bow than with the gun.

QUALITATIVE ANALYSIS

OF THE

MINERAL SPRINGS OF ESSEX COUNTY, VT.

By HIRAM A. CUTTING, A. M., M. D.,

LUNENBURG, VERMONT.

All spring waters are everywhere more or less impregnated with mineral matter, but it is only those that are highly charged with minerals or gases that come under the head of mineral springs. This mineral element is derived from the rocks and soil through which the water passes, and as far back as history gives us reliable *data*, has been used by mankind to restore health or renew the youth of the old. In the early ages it was supposed that there was a fountain capable of restoring the charms and vigor of youth, and thus allow the partaker to live on for thousands of years, if not forever.

When mankind failed to find such a fountain, that virtue was ascribed to dew, and it was supposed that if a person drank no other beverage, continued youth would be his. When America was discovered all the sanguine believers in such a fountain turned their attention to the new world. It was this alone that brought many adventurers hither. This was one of the incentives that led De Soto to push westward, immortalizing his name by the discovery of the Mississippi. He, however, crossed this river discovering the hot springs of Arkansas, which he and his followers supposed to be the fabled fountain of youth. By the less credulous portion of mankind such springs have been used for the treatment of diseases, many times with the best results.

The Greeks and Romans were well acquainted with their virtues. As the methods of analytical chemistry have been improved, they have been used to analyze such waters, yet the problem is always a difficult one, and as improvements are made in the methods of analysis we find from time to time different ingredients discovered in them, the presence of which had been previously unsuspected.

Mineral springs are by common consent divided into four classes, Acidulous, Sulphurous, Chalybeate and Saline. Acidulous are charged with carbonic acid; Sulphurous with sulphuretted hydrogen; Chalybeate contain some of the salts of iron. Saline embrace a much larger variety, yet all contain in combination or singly some of the salts. It is also frequent in the same spring to find a combination of ingredients, yet one class will more fully predominate.

With these preliminary remarks we will enter upon the subject more immediately before us, which is to describe the mineral springs of Essex County. This is as yet comparatively a new field of inquiry. Though it may be known that Essex county has mineral springs, their nature, what they contain, whether valuable ingredients or otherwise, has never been inquired into. The largest are the springs in Brunswick. They are situated on the bank of the Connecticut, perhaps twenty feet above the surface of the river. The water boils up in a semicircle in six or seven places, and, what is remarkable, seems to be of different mineral strength. One spring is pure as any spring water, while all the others are impregnated in a greater or less degree. On the top of the bank, a few feet higher and perhaps a dozen rods distant from these springs, is a pond covering twenty-five or thirty acres. The water in this pond is clear and cold and usually contains an abundance of fish, but once perhaps in ten or twelve years the fish suddenly sicken, and in a few hours all die. In their spasmodic efforts they roil up the water, otherwise clear, and it has a milky appearance for several days. This gradually subsides and in two or three years it is as full of fish as before. The frogs also leave the pond in great numbers when the fish die, and for several weeks no animal life is seen around it. The cause of this great mortality is not known, yet it seems not improbable that the gas engendered from the same cause that impregnates the spring, may occasionally escape through the pond impregnating the water, and thus destroying the animal life within it. The geological formation is here in some doubt, but the springs appear to issue from the mica slate formation; yet near its conflux with the protogine and granite of northern Essex.

A qualitative analysis of the strongest spring gives the following results: One gallon of water contains 87½ grains mineral and organic matter which is composed of:

Carbonate of Potash,
Carbonate of Soda,
Carbonate of Lime,
Carbonate of Magnesia,
Protoxide of Iron,
Sulphuric Acid,
Silicic Acid,
Carbonic Acid,
Chlorine, and a residum of organic matter not yet determined.

This spring, although chalybeate, is also strongly saline, being highly charged with alkaline salts.

Very near this spring another boils up impregnated with sulphuretted hydrogen. It has 55⅛ grains of mineral to the gallon. It is strongly impregnated with sulphur, but does not contain so much saline matter as the others, yet it is a strong chalybeate alkaline water, and both must be very useful in cutaneous diseases, also as an alterative. Water collected from a third spring within a few inches contained 49 grains of mineral to the gallon, and is similar to the first mentioned only not so strong.

These springs perhaps more nearly resemble the chalybeate springs of Germany than any others in New England, and are deserving of further investigation.

Next in importance seems to be a spring in Lunenburgh. This spring is situated near where the mica slate of the north unites with the talcose slate of the south part of the town, but really issues in the protogine formation of the river valley. It is within about ten rods of the Connecticut River, and on our warmest days the thermometer stands at 46½° F. in its water. It is strongly chalybeate; a gallon of water containing 46 grains of mineral, a very large proportion of which is iron. It contains:

Protoxide of Iron,
Carbonate of Potash,
Carbonate of Soda,
Carbonate of Lime,

and a slight trace of magnesium and a residuum of organic matter. I find only a faint trace of sulphur compounds, and it evolves no gas. This water doubtless will be found very valuable as an alterative and tonic, as it is so strongly impregnated with iron as to impart a yellowish tinge to the water. It is a large spring and like those in Brunswick, is not affected by drouth and only slightly in temperature by the seasons. The extension of the White Mountain Railroad passes on the opposite bank of the river, so this spring is easy of access.

(To be continued.)

INDIAN HISTORY
OF
NORTHERN VERMONT.

BY WM. W. GROUT, ESQ.,

BARTON, VT.

Messrs. Editors:

The Indian history of Vermont, concerning which you ask me to give such facts and traditions, as may throw some light upon the obscure yet interesting subject, and thus contribute, in some slight degree, data for the science of Ethnology is, indeed, very meagre. The prevalent and mainly correct notion is, that we have no Indian history worthy the name. Except in a few places the Indians did not dwell permanently within the present limits of Vermont; and no tribe or tribes claimed or exercised undisputed jurisdiction over the State or any considerable portion of it. If they did, the pen of history and the tongue of tradition are equally silent. The Iroquois, it is true, occupied a narrow strip along Lake Champlain and the west line of the state. The Coossucks held points upon the Connecticut through the upper half of the state's length; and I presume points upon the lower half were occupied by Pequots. The tribes of the St. Francis naturally hunted and fished along the extreme northern portions of Lake Champlain and the Missisquoi River, also in the neighborhood of Lake Memphremagog. But the great central region of the state, in fact all, except the narrow limits already named, was uninhabited by the red man; at least no evidences of a permanent occupation have ever been found.

This peculiarity of our aboriginal history may be traced partly to the law regulating the distribution of population over the earth's surface; and partly to the physical conformation of our state, and the relation thereto of the great tribes then surrounding it. It is a law governing man, whether civilized or uncivilized, that he seeks the lakes and rivers and seaboard, and is there found in greatest numbers. The reason for this law is that with the *civilized*, navigable water is essential to commerce which is the main support of all great cities; while water communication, upon small streams even, aids the roving, wandering habits of the *uncivilized*, besides furnishing an easy sustenance for upholding life. It will be seen at a glance that this law applied to the mountainous and broken territory of Vermont, through the body of which no considerable streams of water course, would not favor an Indian occupation remote from the Connecticut, or from Champlain or Memphremagog. But in addition to this, the discerning mind will discover another reason against the occupation of our state by the aborigines. It existed in the relation of the surrounding tribes to our territory and to each other. The Iroquois were a powerful and a warlike tribe on the west. The Pequots another on the south. The Coossucks and St. Francis were still others upon the east and north. Between these fierce tribes, jealousies, rivalries and animosities, of course, held accustomed sway; and they were, doubtless, saved from constant war only by the friendly intervention of these Green Mountains. Poetry will apply the same law to these savage nations, as if civilized:

———"Mountains, interposed, make friendly,
States which else had been at war."

Thus, must Vermont have been a kind of middle or neutral ground, lying between and separating the territory of the surrounding tribes; common for the purposes of hunting and fishing to all, but safe as a home to none—and hence unoccupied. These conclusions are, of course, somewhat conjectural, but are offered in the spirit of scientific and historic inquiry, and, in willing obedience to truth, will yield when better are offered.

At such points within the state as under the forgoing limitations, would naturally attract an Indian population, Indians are known to have existed; for certain relics and rude implements of their sort have been found, which settle beyond reasonable doubt the question of occupation. Such relics have been frequently found along the Connecticut and upon the Passumpsic. A well formed hatchet and wedge, believed to have come from a quarry in the state of Maine, were recently found at the confluence of Moose River with the Passumpsic in the town of St. Johnsbury. Relics and monuments of a highly interesting and instructive character, have been lately discovered at Swanton, in Franklin County. In this county places have been found where Indians evidently finished up their stone implements; which, taken with the fact that the implements themselves are of stone not found in this county, argues that they were brought here in an unfinished state, and finished at leisure; which further argues the presence of a considerable Indian population, at some remote time never to be ascertained or definitely fixed by the research of man. At Indian Point upon Lake Memphremagog near Newport, it is supposed an Indian village once existed, inasmuch as arrow heads and other relics have there been found; also a burial place, the bones of which have been brought to view as the lake has washed away its banks.

To the man who loves the study of his kind, these relics and remains are fraught with a peculiar interest; as telling the story of a race of men who, numerous and powerful, less then four centuries ago held undisputed dominion over this whole continent, but who have now become nearly extinct beneath the restless tread of our aggressive civilization.

Right here is a question for scientific men: why is it, that the Indian race fade away before the approach of the Caucassian? It is not so with the African; he multiplies fastest when brought into closest contact with the white, and the fruits of miscegenation show an unmistakable ascendency of the distinctive traits and peculiarities of the African. But for some unaccountable reason the reverse is true of the Indian. Well marked cases in point exist in this county. Several families of unquestionable Indian antecedents, now show no trace whatever of aboriginal character. The prominent cheek bones are the last to yield. The straight hair, tawny skin and peculiar color and expression of the Indian eye linger for a time, but the fourth, and in many instances the third generation, not merely makes obscure, but obliterates them all. As the Indian tribes, up and down the whole continent, have melted away before the pale glance of the Caucassian; so Indian blood when mixed with white, loses its essential qualities, and every vestige of Indian character is melted away and absorbed by the Yankee.

And here the question recurs with more than original force, why is this so with the Indian, while the African, with none of his aggressive and warlike attributes, is found to outlive the white under the test of amalgamation? His blood when mixed with the Caucassian is found to assert more than its share of race peculiarities. Can this law be traced home to some natural cause and accounted for upon some scientific analysis; or does it rest in the Divine predestination of the races, through which this poor and despised people are yet to reach their just estate in the future? This question, so full of interest, is left for the learned to answer.

Besides Indian Point already named, Orleans County can boast another place identified with Indian history, viz.: the thriving village of Barton Landing, which takes its name therefrom. Barton River from Memphremagog to the Landing was readily navigated by the Indian with his light canoe. At this point, however, he encountered the falls and a landing was necessary, the first from the Lake—

hence the name. From thence to this village would be but one portage, and here another—where, upon the "fair bosom" of Crystal Lake, he could again launch his tiny bark and hold his course by water. Then another portage *via* Butternut Flats in Sutton,—relieved, to be sure, by Bean and two other ponds on the summit, then longer and deeper than now,—to the head waters of the Passumpsic; thence with the flow of that river to the Connecticut. Thus, according to tradition, did Indians of the Coossuck and St. Francis tribes, pass upon friendly or hostile expeditions from the lodges, villages and hunting grounds of the one to those of the other; which, it will be noticed, in the main lay outside the limits of Vermont.

Besides this, there were other routes of Indian travel across the state, more used and better known in its early annals. They lay along the present course of the Vermont Central and Rutland and Burlington Railroads, as this one lies along the Passumpsic road.

Thus do we see the civilization of to-day, following the trail of the untutored child of the forest through the great, natural gateways of our state, between tide water on the north and tide water on the south; though instead of the birchen canoe, propelled by the puny arm of man, science, invention, and the mechanic arts have stepped in, and the transit is now made upon the velvet cushion of a palace car—drawn by a horse of iron, whose breath is flame, and whose nerves are steel.

It might be proper to add, that as the name of the "Landing," is first traceable to Indian tradition, so it was perpetuated by the pioneer settlers of this town; who, without water communication to the southward and without roads, shipped their salts and other products to Montreal, navigating Barton River from the "Landing" with flatboats; also the Lake, and returning with household necessities in exchange, were there again compelled to make a "Landing." Such is the origin, history and signification of a term, which, to the stranger, is suggestive of wharves, steamboats, sloops and ships of the line.

Meteorological Register, kept by J. M. Currier, M. D., at Newport, Vt.*

DECEMBER, 1869.

	THERMOMETER IN THE OPEN AIR.				RAIN AND SNOW.				CLOUDS.			
									7 A. M.			
											Motion of higher clouds.	
Day of Month.	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction.
1	39.0	27.3	16.0	23.4	Night.	7 A. M.	.50	......	10	Nim.	2	N. W.
2	8.4	12.0	7.2	9.2	......	......	......	......	8	Cu. st.	1	W.
3	3.1	12.1	4.1	6.4	......	......	......	......	1	St.	—	——
4	4.0	16.0	20.0	13.3	12 M.	......	......	......	1	St.	—	——
5	25.0	22.0	16.0	21.0	......	5 A. M.	.30	3.50	10	St.	1	N. W.
6	0.0	10.6	10.2	6.9	......	......	......	......	5	Cu. st.	1	S. W.
7	8.0	7.2	–0.3	4.9	......	......	......	......	10	Nim.	1	N. W.
8	–8.0	14.2	1.0	3.4	......	......	......	......	0	0	—	——
9	5.0	24.0	14.0	14.3	......	......	......	......	1	Cir. st.	—	——
10	14.0	34.0	23.0	23.6	......	......	......	......	2	Cir. st.	0	W.
11	28.2	36.0	31.0	31.7	......	......	......	......	10	Nim.	1	S. W.
12	32.0	38.2	33.4	34.5	1¾ P.M.	......	......	......	10	Nim.	0	——
13	21.6	24.0	16.8	20.8	......	Night.	.40	2.70	10	Nim.	—	——
14	0.0	12.8	2.0	4.9	......	......	......	......	0	——	—	——
15	–3.0	27.0	18.9	14.3	......	......	......	......	1	Cir. st.	1	N. W.
16	23.8	36.0	33.2	31.0	6½ P.M.	......	......	......	10	Nim.	0	——
17	34.0	39.0	33.0	35.3	......	Night.	.20	......	10	Nim.	—	——
18	31.0	34.9	30.0	31.9	8 P. M.	......	......	......	10	Nim.	—	——
19	28.0	26.2	21.3	25.1	......	......	.60	5.40	10	Nim.	—	——
20	23.0	27.2	18.0	22.7	......	......	......	......	10	Nim.	—	——
21	25.8	23.0	13.0	20.6	......	......	......	......	9	Cir. st.	1	W.
22	23.0	36.0	38.0	32.3	......	11 P.M.	.50	4.00	10	Nim.	—	——
23	26.0	32.1	25.0	27.7	......	......	......	......	1	Cir.	3	W.
24	17.0	23.4	32.7	21.0	......	......	......	......	10	Nim.	1	N. W.
25	20.0	35.4	29.0	28.1	......	......	......	......	1	St.	0	N. W.
26	23.3	34.8	28.0	24.7	......	......	......	......	10	Cu. st.	1	W.
27	29.7	39.0	36.0	34.9	10 P.M.	......	......	......	10	Nim.	—	——
28	38.0	40.4	33.3	37.2	......	......	1.10	......	10	Nim.	—	——
29	34.0	36.0	34.4	34.8	......	Night.	.40	1.20	10	Nim.	—	——
30	30.0	34.5	34.0	32.8	......	......	......	......	10	Cu. st.	1	S. W.
31	29.0	28.2	28.0	28.4	......	......	......	......	10	Cu.	2	W.
			Mn.	25.51		Sums.	4.00	16.80				

---

* For explanations see last page of this article.

DECEMBER, 1869.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds.		Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds.								
		Velocity.	Direction			Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of Month.
9	Cu. st.	2	W.	5	Cu. st.	2	W.	W.	3	W.	3	W.	3	1
9	Cir. st.	1	N. W.	1	St.	1	N.	W.	1	W.	0	N.	1	2
1	Cir.	1	N.	1	St.	—	——	N.	1	N.	1	N.	0	3
10	Nim.	—	——	10	Nim.	—	——	S.	0	S.	3	S.	4	4
5	Cir. st.	1	S. W.	10	——	—	——	N. W.	1	N. W.	2	N.	0	5
2	Cir.	1	S. W.	10	——	—	——	N.	1	N.	1	N.	2	6
3	Cir. st.	0	N.	0	0	—	——	N. W.	3	N. W.	3	N.	0	7
0	0	—	——	1	St.	—	——	S.	1	S.	0	S.	1	8
1	Cir. st.	—	——	0	0	—	——	S.	1	S.	1	S.	3	9
2	Cir. st.	0	S.	4	Cir. st.	1	S. W.	S. W.	3	S.	2	S.	2	10
10	Nim.	0	S.	5	Nim.	1	S. W.	S.	1	E.	0	S.	0	11
10	Nim.	1	S. W.	10	Nim.	—	——	N.	0	S.	1	S.	0	12
10	Nim.	—	——	10	Nim.	—	——	N. W.	1	N. W.	1	N. W.	0	13
0	——	—	——	0	——	—	——	N. W.	1	N. W.	0	S.	1	14
1	St.	0	——	4	Cu. st.	1	S.	N. W.	1	S.	1	S.	1	15
6	Cu. st.	1	S.	10	Nim.	1	S.	S.	1	S.	0	S.	0	16
10	Nim.	1	N. W.	10	Nim.	—	——	N.	0	S. E.	0	S.	0	17
10	Nim.	—	——	10	Nim.	—	——	N. W.	0	N. W.	0	N.	2	18
10	Nim.	—	——	10	Nim.	—	——	W.	2	S. W.	3	W.	4	19
10	Nim.	1	W.	10	Nim.	—	——	W.	3	W.	3	W.	0	20
8	Cir. st.	1	N. W.	6	Cir. st.	1	N. W.	S.	0	N.	0	N.	0	21
10	Nim.	—	——	10	Nim.	—	——	S.	4	S.	4	S.	0	22
9	Cu. st.	1	W.	10	Nim.	—	——	W.	4	S. W.	2	S. W.	0	23
9	Cu.	1	N. W.	2	St.	—	——	N. W.	1	S.	0	S.	2	24
2	Cir.	0	N. W.	1	St.	—	——	S.	1	S.	2	S.	0	25
9	Cu. st.	0	S. W.	0	0	—	——	S.	0	S. W.	0	N.	0	26
10	Nim.	—	——	10	Nim.	—	——	N.	0	N.	0	N.	0	27
10	Nim.	—	——	10	Nim.	—	——	S.	0	S. W.	0	N.	1	28
01	Cu.	1	W.	10	Cu.	1	W.	N.	0	W.	1	W.	1	29
10	Nim.	—	——	4	Cu.	1	S.	S.	1	S.	1	S.	1	30
10	Nim.	1	W.	3	W.	—	——	W.	4	N. W.	2	N. W.	3	31
—	——	—	——	—	——	—	——	——	—	——	—	——	—	—

JANUARY, 1870.

Day of Month.	Thermometer in the Open Air.				Rain and Snow.				Clouds.			
									7 A. M.			
											Motion of higher clouds.	
	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloudiness.	Kind of clouds.	Velocity.	Direction.
1	22.0	26.0	22.0	23.3	......	......	......	......	10	Nim.	—	——
2	31.0	36.8	43.4	37.0	1 P. M.	......	......	......	10	Nim.	1	S. W.
3	35.3	37.5	34.0	35.6	......	Night.	.40	......	10	Cu. st.	2	S. W.
4	19.0	31.8	27.0	25.9	......	......	......	......	10	Cu. st.	1	S. W.
5	14.0	23.0	15.0	17.3	......	......	......	......	1	Cu. st.	1	W.
6	21.0	29.0	32.0	27.3	6 A. M.	......	.20	2.00	10	Nim.	—	——
7	12.0	9.0	1.0	7.3	......	8 A. M.	.10	1.70	10	Nim.	—	——
8	0.0	14.0	2.8	5.6	......	......	......	......	9	Cu. st.	1	S. W.
9	3.0	2.0	-6.0	-0.4	......	......	......	......	9	Nim.	1	N. W.
10	4.0	21.0	16.0	13.6	5 P. M.	......	......	......	9	Cu. st.	1	S. W.
11	22.0	20.0	15.0	19.0	10 P.M.	9½ A.M.	.30	2.60	10	Nim.	—	——
12	25.3	32.0	30.0	29.1	......	8 P. M.	.50	4.60	10	Nim.	—	——
13	14.3	3.0	0.0	5.7	7 A. M.	8 P. M.	.40	4.00	10	Nim.	2	N. W.
14	-22.0	-5.3	-12.0	-13.1	......	......	.40	4.00	0	0	—	——
15	16.0	31.0	32.0	26.3	1 P. M.	......	......	......	10	Nim.	—	——
16	35.3	33.0	22.0	30.1	......	9 A. M.	.20	......	10	Nim.	—	——
17	33.0	42.0	40.0	38.3	8 A. M.	Night.	——	......	10	Nim.	—	——
18	29.0	28.0	22.7	26.5	......	......	——	......	2	Cu. st.	0	W.
19	16.0	23.0	15.0	18.0	......	......	......	......	3	Cu.	1	N. W.
20	16.0	32.6	28.0	25.5	......	......	......	......	3	St.	2	W.
21	31.2	19.0	10.0	20.0	......	......	......	......	10	Cu.	1	W.
22	11.0	26.0	27.0	21.3	......	......	......	......	0	0	—	——
23	39.7	40.2	32.0	37.3	8 A. M.	3 P. M.	.30	......	10	Nim.	2	S. W.
24	12.0	15.0	15.3	14.1	10 P.M.	......	......	......	3	Cu. st.	2	W.
25	15.0	30.0	33.3	26.1	......	7 P. M.	1.00	9.50	10	Nim.	—	——
26	33.0	40.2	37.2	36.8	......	......	.20	......	10	Nim.	—	——
27	32.0	36.0	21.2	29.7	......	......	......	......	10	Nim.	—	——
28	14.0	28.0	18.0	20.0	......	......	......	......	10	Cu. st.	2	N. W.
29	16.2	31.1	29.0	25.4	9½ A.M.	......	......	......	10	Nim.	2	S. W.
30	28.0	21.0	6.0	18.3	......	9 A. M.	.40	2.60	10	Nim.	—	——
31	-14.0	22.0	18.0	8.7	8½ P.M.	......	......	......	3	St.	1	N. W.
			Mns.	21.4		Sums.	——	31.00				

JANUARY, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
		Motion of higher clouds.				Motion of higher clouds.								
Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of the Month.
2	Cir.	1	W.	10	Nim.	—	——	N.	0	N. W.	0	S.	0	1
10	Nim.	—	——	10	Nim.	—	——	S. E.	3	S. E.	4	S. E.	5	2
10	Cu.	3	S. W.	10	——	—	——	S.	2	S.	3	S.	2	3
9	Cu. st.	1	S. W.	10	Nim.	—	——	E.N.E	1	S. W.	1	S.	0	4
6	Cu.	2	W.	0	——	—	——	S. W.	0	W.	2	S.	0	5
10	Nim.	—	——	10	Nim.	—	——	S.	3	S.S.W.	2	S.	0	6
1	Cir.	1	W.	0	0	—	——	N. W.	2	W.	3	N.	1	7
10	Nim.	—	——	0	0	—	——	S.	1	W N W	1	S.	7	8
1	Cir.	1	N. W.	1	Cir.	—	——	N.N.E	0	N. W.	0	S.	2	9
10	Cu. st.	0	S.	10	Nim.	—	——	S.	1	S.	2	S.	0	10
2	Cu. st.	1	N. W.	3	St.	—	——	W.	2	N. W.	2	S.	0	11
10	Nim.	—	——	10	Nim.	—	——	S.	2	S.	1	W.	2	12
10	Nim.	—	——	10	Nim.	—	——	N. W.	3	N. W.	2	N. W.	3	13
1	St.	0	——	0	0	0	——	N. W.	0	N. W.	1	N. W.	0	14
10	Nim.	—	——	10	Nim.	—	——	S.S.W.	2	S.S.E.	3	S.	3	15
1	Cir.	2	N. W.	0	0	—	——	WSW.	1	N. W.	3	N. W.	0	16
10	Nim.	—	——	10	Nim.	—	——	S.	3	S.	5	S.	2	17
3	Cir.	1	S. W.	2	Cir.	2	W.	WSW.	0	W.	0	N. W.	3	18
3	Cu. st.	1	S.	0	0	—	——	S.	1	S.	0	S.S.E.	0	19
3	St.	2	S. W.	2	Nim.	—	——	S.	0	S.	1	S.	1	20
1	Cu.	1	W.	0	0	—	——	N. W.	2	W.	3	S.	0	21
10	Nim.	—	——	10	Nim.	—	——	N. W.	0	S.	2	S.	4	22
10	Nim.	—	——	10	Nim.	1	N. W.	S.	1	N. W.	1	N. W.	2	23
9	Cu. st.	1	W.	10	Nim.	—	——	N. W.	2	N.	1	N.	0	24
10	Nim.	—	——	10	Nim.	—	——	N.	0	S.	0	S.	0	25
3	Cu.	2	W.	10	Nim.	—	——	S.	0	WSW.	2	S.	2	26
8	Cu.	2	S. W.	1	Cu.	1	N. W.	W.	0	W.	1	N. W.	0	27
3	Cu.	2	WSW.	1	Cu.	1	W.	S.S.E.	3	NNW.	1	S.	1	28
10	Nim.	2	S. W.	10	Nim.	—	——	S.	3	S.	3	S.	0	29
1	Cu.	2	N. W.	0	0	—	——	N. W.	2	N. W.	2	N.	0	30
1	St.	1	W.	10	Nim.	—	——	S.	1	S.	1	S.	0	31

FEBRUARY, 1870.

Day of Month.	THERMOMETER IN THE OPEN AIR.				RAIN AND SNOW.				CLOUDS. 7 A. M.		Motion of higher clouds.	
	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction
1	20.0	19.0	2.0	13.6	......	4 P. M.	.20	1.00	10	Nim.	—	———
2	-12.0	12.0	10.0	3.3	9 A. M.	......	.30	2.00	10	Nim.	1	S.
3	4.8	11.0	5.0	6.9	......	1½ P.M.	.20	1.80	10	Nim.	—	———
4	-24 0	0.0	-3.0	-9.0	......	......	......	......	0	0	—	———
5	3.0	23.0	15.0	22.6	......	......	......	......	10	Cir. st.	1	S. W.
6	6.0	25.8	16.0	15.9	......	......	......	......	4	St.	0	S. W.
7	15.0	37.0	15.0	22.3	......	......	......	......	10	Nim.	—	———
8	11.0	22.0	23.0	18.6	5 P. M.	......	......	......	10	Nim.	—	———
9	23.0	23.3	23.1	23.1	......	......	1.00	8.00	10	Nim.	—	———
10	20.0	21.1	20.0	20.3	......	10 P.M.	.10	.50	10	Nim.	—	———
11	2.0	17.8	16.0	17.9	10 P.M.	......	......	......	1	St.	1	W.
12	26.0	39.4	23.0	29.4	......	7 P. M.	.30	2.30	10	Nim.	—	———
13	2.0	5.0	-8.0	-0.3	......	......	......	......	5	Cu.	1	N. W.
14	4.0	22.4	26.2	17.5	1 P. M.	......	......	......	10	Cu. st.	1	S. W.
15	34.6	37.0	28.0	33.2	......	8 A. M.	1.60	.30	10	Nim.	—	———
16	11.8	19.0	15.0	15.2	......	......	......	......	9	Cu. st.	1	N. W.
17	-2.0	31.2	32.0	20.4	......	......	......	......	1	Cir. st.	0	S. W.
18	36.0	40.0	42.0	39.3	1 P. M.	......	......	......	9	Cu. st.	0	S.
19	9.2	14.0	8.0	10.4	......	11 A.M.	1.80	......	10	Nim.	—	———
20	-1.0	30.8	24.2	18.0	......	Night.	......	......	1	St.	0	———
21	15.0	9.0	2.0	8.6	......	......	.40	5.30	10	Nim.	—	———
22	-5.0	12.0	4.8	4.0	......	7½ A.M.	.20	2.60	9	Nim.	1	W.
23	9.0	23.0	17.0	16.3	......	......	......	......	3	St.	2	W.
24	7.3	13.0	3.2	7.8	......	......	......	......	10	Cu.	1	S. W.
25	1.2	10.0	9.0	6.7	7 P. M.	......	......	......	10	Nim.	—	———
26	9.7	18.4	18.2	15.4	......	7½ P.M.	.20	1.00	10	Nim.	—	———
27	7.0	29.0	22.2	19.4	7 P. M.	......	......	......	10	Nim.	—	———
28	22.0	36.2	28.0	28.7	......	......	.40	3.00	10	Nim.	—	———
			Mn.	15.91			6.70	27.80				

FEBRUARY, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
		Motion of higher clouds.				Motion of higher clouds.								
Am t of cloud'n's.	Kind of clouds.	Velocity.	Direction	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of Month.
10	Nim.	—	——	0	0	—	——	S.	0	N. W.	2	N. W.	4	1
10	Nim.	—	——	10	Nim.	—	——	S.	1	S.	0	S.	0	2
10	Nim.	1	W.	7	Nim.	—	——	N. W.	1	N N W	1	N. W.	1	3
1	St.	—	——	1	St.	—	——	S.	1	W.	1	S.	1	4
2	St.	1	W.	2	Cir.	0	S.	S.	1	S.	1	S.	1	5
9	Cu.	1	W.	5	Cu.	1	W.	S.	0	S. S. E.	0	S.	0	6
9	Cu. st.	1	S. W.	0	0	—	——	S.	0	S. S. E.	0	N. W.	0	7
10	Nim.	—	——	10	Nim.	—	——	S.	0	N. W.	0	N. W.	0	8
10	Nim.	—	——	10	Nim.	—	——	N. W.	3	N. W.	3	N. W.	1	9
10	Nim.	—	——	10	Nim.	1	W.	W.	0	N. W.	1	N. W.	3	10
1	St.	1	N. W.	10	Cu.	1	W.	N. W.	1	S.	0	S.	3	11
10	Cu.	1	W.	7	Cu.	1	W.	S. W.	2	S. W.	3	W.	5	12
1	Cu.	1	W.	0	0	—	——	W.	3	N. W.	2	S. W.	2	13
10	Nim.	—	——	10	Nim.	—	——	S. E.	2	S.	4	S.	1	14
9	Cu.	1	N. W.	10	Nim.	—	——	S. S. E.	0	W.	1	N. W.	1	15
0	0	—	——	1	St.	2	N. W.	N. E.	1	N. W.	1	N. W.	0	16
2	Cu.	2	W.	5	Cu. st.	2	S. W.	S. S. E.	1	S.	3	S.	3	17
10	Nim.	—	——	10	Nim.	—	——	S.	4	S.	2	S.	2	18
9	Cu. st.	0	S. W.	0	0	—	——	W N W	3	N. W.	3	N. W.	2	19
0	0	—	——	0	0	—	——	N. W.	1	S.S.W.	0	S.	1	20
10	Nim.	—	——	10	Nim.	—	——	W.	2	N N W	2	N. W.	3	21
1	Cir.	1	W.	0	0	—	——	S. W.	3	S.	2	S.	0	22
9	Nim.	2	S. W.	5	Cu.	—	——	S. W.	2	S.	3	S.	1	23
10	Cu.	1	N. W.	5	Cu.	—	——	S.	1	N. W.	2	N. W.	0	24
1	Cir.	—	——	10	Nim.	—	——	N. W.	0	N. W.	1	W.	1	25
10	Nim.	—	——	10	Nim.	—	——	W.	3	W N W	3	N. W.	1	26
6	Cu. st.	1	S. W.	10	Nim.	—	——	N N W	0	S. S. E.	0	S.	0	27
10	Nim.	—	——	6	Nim.	—	——	S.	0	S.	0	N. W.	0	28
—	——	—	——	—	——	—	——	——	—	——	—	——	—	—

MARCH, 1870.

	THERMOMETER IN THE OPEN AIR.				RAIN AND SNOW.				CLOUDS. 7 A. M.			
											Motion of higher clouds.	
Day of Month.	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction
1	28.0	33.0	25.0	28.6	......	9 A. M.	.20	.70	10	Nim.	—	———
2	19.2	16.0	14.1	16.4	11 A.M.	......	......	......	10	Nim.	—	———
3	10.0	13.0	2.6	8.8	......	8 A. M.	.50	2.80	10	Nim.	—	———
4	-4.0	23.0	12.0	10.3	......	......	......	......	10	Nim.	—	———
5	4.0	28.0	20.0	17.3	......	......	......	......	10	Fog.	—	———
6	13.0	32.0	20.0	21.8	......	......	......	......	10	Nim.	—	———
7	9.0	32.0	24.0	21.6	......	......	......	......	10	Cu. st.	—	———
8	7.0	32.0	15.0	18.0	......	......	......	......	3	St.	0	S. W.
9	9.0	30.8	23.1	20.9	......	......	......	......	10	Cu. st.	1	N. W.
10	17.4	22.0	11.0	16.8	......	......	......	......	4	Cu. st.	3	W.
11	-9.0	13.0	-2.0	-3.0	......	......	......	......	0	0	—	———
12	-18.0	18.0	14.0	4.6	......	......	......	......	0	0	—	———
13	8.0	32.0	23.0	21.0	......	......	......	......	2	Cu. st.	1	S. W.
14	8.0	30.0	20.0	19.3	......	......	......	......	2	St.	1	W.
15	5.0	35.0	25.0	21.6	......	......	......	......	0	0	—	———
16	7.0	39.0	36.3	24.4	3½ P.M.	......	......	......	10	Cu. st.	1	S. W.
17	30.0	30.6	25.0	28.5	......	10 P.M.	.10	1.40	10	Nim.	—	———
18	25.0	33.6	21.0	26.5	......	......	......	......	10	Cu. st.	2	N.
19	7.3	35.3	22.0	21.5	......	......	......	......	0	0	—	———
20	14.0	49.7	35.3	33.0	......	......	......	......	3	Cir. st.	2	N. W.
21	34.8	44.3	36.0	38.3	6 A. M.	......	.30	......	10	Nim.	—	———
22	36.0	41.4	33.3	36.9	......	......	.20	......	10	Cu. st.	1	N. W.
23	25.0	26.0	24.3	25.1	......	Night.	.20	.60	10	Nim.	—	———
24	14.5	19.0	20.0	17.8	......	......	......	......	4	Cir. st.	2	N. W.
25	8.5	21.0	13.0	14.1	......	......	......	......	0	0	—	———
26	4.0	40.0	29.0	24.3	......	......	......	......	2	Cir. st.	1	N. W.
27	27.2	37.0	31.0	31.7	......	......	......	......	3	St.	1	S. W.
28	38.0	43.0	38.0	39.6	......	......	......	......	10	Cu. st.	2	S.
29	36.4	45.0	36.0	39.1	......	......	......	......	10	Cu. st.	0	S.
30	36.7	45.3	37.0	37.6	......	......	......	......	4	Cir. st.	2	S. E.
31	28.0	50.0	37.2	38.4	......	......	......	......	0	0	—	———
			Mns.	23.3		Sums.	1.50	5.50				

MARCH, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
Am t of cloud'n's.	Kind of clouds.	Motion of higher clouds.		Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds.								
		Velocity.	Direction			Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of Month.
10	Cu. st.	1	W.	10	Cu. st.	—	——	N. W.	0	W.	3	W.	2	1
10	Cu. st.	—	——	10	Cu. st.	2	N. W.	N. W.	0	N. W.	4	N. W.	3	2
1	Cu. st.	1	N. W.	0	0	—	——	N. W.	3	N. W.	3	S.	4	3
10	Cu. st.	—	——	0	0	—	——	S.	1	S.	0	S.	0	4
3	Cu. st.	0	W.	2	Cu. st.	—	——	S.	0	S.	0	N. W.	1	5
10	Nim.	—	——	10	Nim.	—	——	S.	1	N.	0	N.	0	6
10	Cu. st.	—	——	10	Nim.	—	——	N.	0	N. W.	1	N. W.	0	7
2	St.	0	W.	2	St.	0	——	S. E.	1	N. W.	0	N. W.	0	8
4	Cu.	1	N. W.	5	Cu.	2	N. W.	S. S. E.	1	W.	3	N. W.	3	9
3	Cir. st.	1	N. W.	0	0	—	——	W N W	3	N. W.	3	N. W.	3	10
4	St.	—	S.	0	0	—	——	N. W.	1	E.	1	N. W.	0	11
3	St.	1	W.	8	Cu. st.	1	S. W.	S. S. E.	1	S.	1	S.	1	12
10	Nim.	—	——	7	Cu. st.	—	——	N. W.	1	N. E.	2	N. W.	3	13
1	St.	0	S.	0	0	—	——	N N W	1	N N W	1	S.	1	14
0	0	—	——	0	0	—	——	S. S. E.	1	N. W.	0	S.	0	15
10	Cu. st.	1	S.	9	Cu. st.	1	S.	S. S. E.	0	E.	4	S.	4	16
10	Nim.	—	——	10	Nim.	—	——	N. E.	2	N.	3	N.	4	17
9	Cu. st.	2	N.	1	Cir.	2	N.	N.	4	N. W.	3	N.	1	18
0	0	—	——	0	0	—	——	S. S. E.	1	N N W	0	S.	1	19
4	Cir. st.	2	W.	1	St.	—	——	S. S. E.	1	S.	0	S.	0	20
10	Nim.	—	——	10	Nim.	—	——	S.	0	S.	0	N.	0	21
10	Nim.	—	——	10	Nim.	—	——	S.	0	W N W	0	N. W.	0	22
10	Nim.	—	——	10	Nim.	—	——	W.	3	N. W.	3	N. W.	3	23
1	Cir.	3	N. W.	0	0	—	——	N. W.	3	N. W.	4	N. W.	5	24
0	0	—	——	0	0	—	——	N. W.	1	N. W.	1	N. W.	0	25
3	Cir. st.	1	W.	1	Cu.	—	——	N. W.	0	S.	0	S.	0	26
10	Cu. st.	1	S.	10	Nim.	—	——	S.	0	S. E.	5	S. E.	4	27
10	Cu. st.	2	S. E.	10	Cu. st.	—	——	S. E.	3	E.	1	N.	0	28
5	Cir. st.	1	N.	5	Cu. st.	—	——	N.	0	N.	0	N.	0	29
1	Cir.	2	S. E.	0	0	—	——	N. W.	1	N. W.	0	N.	0	30
0	0	—	——	0	0	—	——	S.	0	S.	0	S.	1	31

APRIL, 1870.

Day of Month.	THERMOMETER IN THE OPEN AIR.				RAIN AND SNOW.				CLOUDS.			
									7 A. M.			
											Motion of higher clouds.	
	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction
1	37.0	51.4	40.7	43.0	......	......	......	......	3	Cir. st.	1	N. W.
2	29.8	52.4	36.0	39.4	......	......	......	......	2	St.	0	——
3	34.0	43.4	33.0	36.8	......	......	......	......	1	St.	0	——
4	30.0	39.0	36.0	35.0	......	......	......	......	10	Cu. st.	2	N. E.
5	36.0	49.8	38.0	41.2	......	......	......	......	10	Cu. st.	1	N.
6	33.6	45.3	35.0	37.9	5 P. M.	......	......	......	5	Cu.	1	S. E.
7	35.0	36.8	32.0	34.6	......	......	.20	......	10	Nim.	—	——
8	35.0	51.8	39.6	42.1	......	Night.	.20	......	10	Cu. st.	—	——
9	33.4	51.0	36.0	40.1	......	......	......	......	0	0	—	——
10	30.8	58.0	46.0	44.9	......	......	......	......	0	0	—	——
11	36.0	61.0	49.0	48.6	......	......	......	......	7	St.	0	S.
12	38.8	50.0	40.0	42.7	Night.	7 A. M.	......	......	10	Cu. st.	2	N.
13	31.0	47.0	37.2	38.4	......	......	......	......	0	0	—	——
14	43.0	73.0	50.0	55.3	......	......	......	......	10	Cu. st.	2	W.
15	42.2	44.3	44.4	43.6	......	......	......	......	10	Cu. st.	2	N.
16	42.2	56.0	42.8	47.0	......	......	......	......	2	Cir. st.	1	S. W.
17	35.8	55.0	47.0	45.9	......	......	......	......	2	Cir. st.	2	S. W.
18	47.0	61.0	54.0	54.0	......	......	......	......	1	Cu. st.	1	S.
19	51.5	52.8	43.0	49.1	7½ A.M.	......	.10	......	10	Cu. st.	2	E.
20	38.0	45.7	40.4	41.3	......	......	.50	......	6	St.	1	S. E.
21	36.0	48.0	42.4	40.1	......	......	.10	......	10	Nim.	—	——
22	42.0	58.0	48.0	49.3	......	Night.	.10	......	7	Cir. st.	0	E.
23	43.8	64.0	50.0	52.6	......	......	......	......	9	Cir. st.	1	N. W.
24	50.0	65.0	52.0	55.6	......	......	......	......	2	Cir.	2	N. W.
25	39.0	50.0	38.2	42.4	......	......	......	......	3	Cir.	2	W.
26	46.0	58.0	52.3	52.1	......	......	......	......	7	Cu. st.	2	N. W.
27	46.0	71.0	62.0	59.6	......	......	......	......	1	St.	—	——
28	62.0	70.6	53.0	61.8	......	......	......	......	7	Cu.	2	S. W.
29	39.0	49.5	37.0	41.8	......	......	......	......	1	St.	2	N.
30	34.0	60.2	50.0	48.0	......	......	......	......	1	St.	0	0
			Mn.	45.48		Sums.	1.20					

APRIL, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
		Motion of higher clouds.				Motion of higher clouds.								
Am t of cloud'n's.	Kind of clouds.	Velocity.	Direction	Am't of cloud'n's.	Kind of clouds.	Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of Month.
2	Cir. st.	0	S. W.	0	0	—	———	S.	0	N.	0	S.	0	1
2	Cir.	1	S. W.	0	0	—	———	S.	0	S.	0	N. W.	0	2
8	Cir. st.	2	S. E.	4	Cu. st.	2	S. E.	N.	3	N.	3	N.	4	3
10	Cu. st.	1	S. E.	10	Cu. st.	—	———	N.	4	N.	3	N.	3	4
10	Cu. st.	2	S. E.	1	St.	1	S. E.	N.	3	E.N. E	0	N. E.	0	5
4	Cir.	2	S. E.	10	Nim.	—	———	N.	2	N.	1	N.	1	6
10	Nim.	—	———	10	Nim.	—	———	N. W.	0	N. W.	0	N.	0	7
3	Cir.	2	N.	0	0	—	———	S. S. E.	0	W NW	0	S.	0	8
0	0	—	———	0	0	—	———	S. S. E.	0	N. W.	0	S.	0	9
0	0	—	———	1	St.	0	———	S. S. E.	0	N. W.	0	S.	0	10
8	Cu. st.	—	S.	7	Cu. st.	2	S.	S.	0	S.	3	S. E.	3	11
4	Cu. st.	2	N.	2	Cu. st.	0	N. W.	N.	1	N.	2	N. W.	4	12
1	Cir.	1	N.	0	0	—	———	N N W	3	N. W.	2	S.	1	13
9	Cu. st.	2	W.	7	Cu. st.	2	W.	S. W.	1	S.	2	N.	0	14
10	Cu. st.	—	———	10	Cu. st.	—	———	N.	2	N. W.	3	S.	3	15
2	Cir.	1	W.	2	Cu. st.	1	S. W.	S. E.	3	S.	4	S.	3	16
2	Cir.	2	S. W.	8	Cu. st.	2	S. W.	S.	4	S.	3	S.	0	17
1	Cu.	2	S.	7	Cu.	2	S.	S.	0	S. E.	4	S.	1	18
10	Nim.	—	———	10	Nim.	—	———	N. E.	4	E.	3	N.	1	19
10	Nim.	—	———	7	Cu. st.	—	———	N.	0	N. E.	1	S.	0	20
10	Cu.	1	N. E.	10	Cu.	1	E.	N N W.	0	N N W	0	N.	1	21
10	Cir. st.	1	N.	10	Cir. st.	1	N. E.	W NW	0	WN W	0	S.	0	22
9	Cir.	1	W.	5	Cir.	2	W.	S. S. E.	1	S.	1	S.	1	23
10	Cu.	—	———	10	Nim.	—	———	S. S. E.	2	W.	3	N.	3	24
0	0	—	———	1	S.	—	———	N.	3	N.	4	S.	0	25
4	Cir.	2	N. W.	6	Cu. st.	1	N. W.	S.	1	W.	3	S.	0	26
1	Cir.	1	N. W.	8	Cu. st.	2	N. W.	S.	0	S. W.	1	S.	0	27
10	Cu.	2	S. W.	1	St.	—	———	S.	1	S W.	1	N. W.	3	28
1	St.	0	0	0	0	—	———	N.	2	N.	2	N.	0	29
1	Cir.	1	W.	9	Cu.	—	———	N.	0	S.	1	N	0	30
—	———	—	———	—	———	—	———	———	—	———	—	———	—	—

MAY. 1870.

Day of Month.	THERMOMETER IN THE OPEN AIR.				RAIN AND SNOW.				CLOUDS. 7 A. M.			
	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds. Velocity.	Motion of higher clouds. Direction.
1	42.8	46.0	48.0	45.6	Night.	10 A.M.	.10	......	10	Nim.	—	——
2	43.5	58.4	47.0	49.6	......	......	......	......	0	0	—	——
3	59.2	79.0	63.0	67.0	......	......	......	......	0	0	—	——
4	60.0	53.6	41.3	51.6	10 A.M.	12 M.	......	......	8	Cir.	2	W.
5	38.0	53.0	44.3	45.1	......	......	......	......	4	Cu.	3	N. W.
6	43.2	52.3	42.2	45.9	......	......	......	......	0	0	—	——
7	39.0	60.1	47.0	48.7	......	......	......	......	0	0	—	——
8	42.0	66.3	59.8	56.0	......	......	......	......	3	Cir.	1	W.
9	53.3	51.0	45.1	49.8	Night.	......	......	......	10	Cu.	2	S.
10	43.0	58.0	48.3	49.7	......	8 A. M.	.20	......	10	Cu. st.	2	S. W.
11	43.2	50.0	44.2	45.8	Night.	......	......	......	10	Cu. st.	2	S.
12	37.0	47.0	43.0	42.3	......	......	.70	......	10	Nim.	—	——
13	42.0	52.0	44.0	46.0	......	12 M.	.10	......	10	Cu.	2	N. W.
14	46.0	64.0	64.0	58.0	......	......	......	......	5	Cir. st.	1	N. W.
15	57.0	72.0	60.0	63.0	......	......	......	......	8	Cir.	2	N. W.
16	62.0	67.0	47.3	58.7	3 P. M.	......	......	......	1	Cir. st.	—	N.
17	52.0	63.5	49.0	55.5	......	Night.	......	......	2	Cir.	0	S. E.
18	50.0	72.0	60.2	60.7	......	......	......	......	3	Cir. st.	1	N.
19	58.0	84.3	70.2	70.8	......	......	......	......	10	Cir. st.	1	W.
20	66.0	64.0	52.2	60.7	......	......	......	......	0	0	—	——
21	50.0	50.0	46.0	48.6	12 M.	......	......	......	1	Cir.	1	W.
22	42.0	54.0	47.0	47.6	......	Night.	.20	......	7	Cu.	2	N.
23	45.0	66.0	56.0	55.6	7 P. M.	......	......	......	0	0	—	——
24	50.0	55.3	52.0	52.4	......	......	.30	......	10	Cu.	3	S. E.
25	52.2	64.0	57.0	57.7	......	Night.	.10	......	10	Cu.	3	S. W.
26	47.6	62.0	46.0	51.8	......	......	......	......	10	Cu.	3	N.
27	46.0	66.0	58.0	56.6	......	......	......	......	0	0	—	——
28	52.0	76.3	57.0	61.7	......	......	......	......	2	Cir.	0	W.
29	56.3	80.0	64.2	66.8	......	......	......	......	1	Cir.	1	S.
30	60.4	84.0	69.0	71.1	......	......	......	......	1	St.	0	——
31	70.2	80.1	66.0	72.1	......	......	......	......	1	St.	1	S.
			Mn.	56.53		Sums.	1.70					

MAY, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
Am t of cloud'n's.	Kind of clouds.	Motion of higher clouds.		Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds.								Day of Month.
		Velocity.	Direction			Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	
10	Cu.	2	N. W.	0	0	—	———	S.	0	N. W.	1	N.	1	1
0	0	—	———	1	St.	—	———	S. S. E.	0	N N E	1	S.	1	2
0	0	—	———	0	0	—	———	S.	1	S. W.	1	S. E.	1	3
10	Cu. st.	2	N.	0	0	—	———	S. W.	0	N.	3	N.	0	4
0	0	—	———	0	0	—	———	S. S. E.	1	N N W	4	N N W	0	5
1	Cir.	1	N. W.	0	0	—	———	N N W	3	N.	3	S.	1	6
2	Cir.	2	N. W.	0	0	—	———	S.	0	N. W.	1	N.	0	7
6	Cir.	0	S.	10	Cir.cu.	1	S.	S.	0	N. W.	0	N. W.	0	8
10	Cu.	—	———	10	Nim.	—	———	S. E.	1	E.	2	S.	3	9
7	Cu.	2	S. W.	10	Cu. st.	—	———	S. E.	2	S. E.	2	S.	2	10
10	Cu.	2	S.	9	Cu.	2	W.	S.	1	S. E.	1	S.	0	11
10	Cu.	2	S. W.	9	Cu.	1	N.	W.	0	W.	1	W S W	0	12
6	Cu.	2	N. W.	0	0	—	———	S. E.	0	N.	1	S.	0	13
6	Cir. st.	2	N. E.	4	Cir. st.	1	N. E.	S.	0	S. E.	1	S. W.	0	14
0	0	—	———	0	0	—	———	S. E.	1	N N W	2	N. W.	0	15
10	Cu.	—	———	10	Nim.	—	———	S.	0	N N E	2	N. W.	2	16
1	St.	—	———	0	0	—	———	N N W	0	N.	1	N.	0	17
1	St.	0	N.	0	0	—	———	S.	0	S. S.E.	0	S.	0	18
3	Cu.	1	S. W.	5	Cu. st.	1	N. W.	S.	4	S. W.	3	S. W.	1	19
9	———	—	———	—	———	—	———	W.	2	N.	1	S. W.	0	20
10	Nim.	—	———	10	Nim.	—	———	S. E.	0	N. W.	0	N. W.	0	21
2	Cu.	2	N. W.	2	Cir. st.	1	N. W.	N. E.	0	N. W.	1	S. W.	0	22
7	Cir.	2	W.	10	Nim.	—	———	S.	1	N.	1	S.	0	23
10	Cu.	2	S.	7	Cu.	3	S.	S. E.	4	S.	3	S.	3	24
9	Cu.	2	W.	10	Cu.	3	W.	S. S. E.	1	W.	0	N. W.	1	25
3	Cir.	2	N. E.	0	0	—	———	N. W.	2	N N W	1	N.	0	26
1	Cir.	1	S. W.	0	0	—	———	S.	0	N. W.	2	S.	1	27
4	Cir.	0	S. W.	1	Cir.	0	S.	S. S. E.	0	S.	1	S.	0	28
1	St.	0	0	1	St.	0	———	S. S. E.	1	N. W.	2	S. E.	1	29
2	Cir. st.	1	S: E.	0	0	—	———	S. S. E.	0	N.	1	S.	0	30
1	Cu.	2	S.	1	Cir.	1	S.	S.	1	S.	3	S.	1	31

JUNE, 1870.

Day of Month.	Thermometer in the Open Air.				Rain and Snow.				Clouds. 7 A. M.			
	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds. Velocity.	Motion of higher clouds. Direction
1	66.7	80.0	66.2	70.9	......	......	......	......	1	St.	—	S.
2	68.0	80.4	69.0	72.4	6 P. M.	7 P. M.	......	......	2	Cir. st.	1	S. E.
3	64.0	88.0	72.0	74.6	......	......	......	......	6	Cir. st.	1	S.
4	74.0	86.0	76.0	78.6	......	......	......	......	0	0	—	—
5	70.3	91.0	74.0	78.4	......	......	......	......	4	Cir.	2	S. W.
6	79.0	84.0	72.0	78.3	......	......	......	......	5	Cir. st.	2	S. W.
7	75.0	89.0	67.0	77.0	5½ P.M.	......	.80	......	2	Cir.	2	S. W.
8	68.0	72.0	66.0	68.6	......	5 P. M.	2.30	......	10	Nim.	1	S.
9	68.8	83.0	62.0	71.2	......	......	......	......	6	Cir. cu.	1	S.
10	64.0	74.0	58.0	65.3	......	......	......	......	8	Cir. st.	2	S. E.
11	64.5	82.1	69.0	71.8	3 P. M.	3½ P.M.	.10	......	1	Cir. st.	1	S.
12	68.0	81.0	64.0	71.0	......	......	......	......	4	Cir.	2	S.
13	60.0	79.5	70.0	67.8	3½ P.M.	5½ P.M.	......	......	9	Cir. st.	2	S.
14	61.0	80.0	64.2	75.0	Night.	7 A. M.	.40	......	10	Cir. cu.	2	W.
15	68.0	80.0	68.0	72.0	6½ P.M.	7½ P.M.	.05	......	8	Cir.	2	W.
16	74.7	80.0	68.2	74.3	......	......	......	......	2	Cir.	0	S. W.
17	68.0	79.6	66.0	71.2	......	......	......	......	10	Cir.	3	N. E.
18	65.0	87.0	71.0	74.3	11 P.M.	12 P.M.	......	......	8	Cir. st.	2	N. W.
19	73.2	82.0	71.0	75.4	......	......	.05	......	1	Cir.	0	—
20	72.0	78.0	63.0	71.0	......	......	......	......	4	Cir.	3	W.
21	53.0	55.2	54.0	54.0	......	......	......	......	9	Cir. st.	3	N. W.
22	54.0	64.0	59.0	59.0	......	......	......	......	7	Cir. cu.	3	N. W.
23	58.0	76.0	68.0	67.3	......	......	......	......	8	St.	3	N. E.
24	74.8	90.0	78.0	80.9	......	......	......	......	1	Cir.	1	N. W.
25	77.0	88.0	72.0	79.0	5½ P.M.	......	.05	......	0	0	—	—
26	71.0	76.8	66.0	71.2	......	8 A. M.	.10	......	10	Nim.	—	—
27	64.0	82.0	67.0	71.0	8 A. M.	8 P. M.	.20	......	7	Cir. cu.	1	N. W.
28	73.3	80.0	67.7	73.6	......	......	......	......	10	Cu.	3	N.
29	68.0	75.2	62.0	68.4	......	......	......	......	1	Cir.	1	N. W.
30	....	....	....	....	......	......	......	......	..	....	..	......
—	—	—	—	—	—	—	—	—	—	—	—	—
			Mn.	71.50		Sums.	3.95					

JUNE, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
Am t of cloud'n's.	Kind of clouds.	Motion of higher clouds.		Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds.								
		Velocity.	Direction			Velocity.	Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of Month.
4	Cu. st.	1	W.	0	0	—	———	S. S. E.	2	N. W.	0	S.	0	1
3	Cir. cu.	1	S. W.	6	Cir.cu.	1	S. E.	S.	1	N. W.	0	S. E.	0	2
6	Cu.	1	S. W.	1	St.	—	———	S.	0	S.	1	S.	1	3
2	Cir. cu.	1	S. W.	3	Cir.	1	S.	S.	0	N N W	2	S. S. E.	2	4
3	Cir. cu.	1	S. W.	1	Cir. st.	1	W.	S. S. E.	2	S.	2	S. E.	2	5
9	Cir. cu.	2	S. W.	3	Cir. st.	2	S. W.	S.	3	S.	4	S. W.	2	6
7	Cir. cu.	2	S. W.	10	Cu.	2	S. W.	S.	2	S. E.	1	N. W.	0	7
10	Cu.	3	S. W.	3	Cir.cu.	1	S.	N.	0	N. W.	0	N. W.	0	8
4	Cir.	2	S. E.	3	Cir.	3	S. W.	S.	0	S. E.	0	S.	4	9
9	Cir.	3	S. E.	3	Cir. st.	1	S. W.	S. E.	3	S. W.	1	S.	4	10
10	Cu.	2	S. E.	5	Cu.	3	S. W.	S. E.	3	S.	0	S. E.	3	11
4	Cir.	2	S. W.	3	Cir. st.	1	S.	S.	3	S. W.	3	S.	0	12
8	Cir. cu.	2	S. W.	4	Cir. st.	3	S. W.	S.	0	S. S. E.	2	S.	1	13
7	Cir. cu.	1	S. W.	1	Cu.	1	S. W.	N.	2	S.	1	N. W.	0	14
7	Cir.	2	W.	10	Cir. st.	2	S. W.	S.	0	N.	2	S.	1	15
5	Cir. cu.	0	N. W.	1	St.	—	———	S.	0	N N W	3	S.	1	16
0	0	—	———	1	St.	—	———	S.	0	N.	2	S.	1	17
0	0	—	———	3	Cu. st.	1	W.	S. E.	3	N.	1	N.	0	18
1	Cir.	1	S. W.	2	St.	—	———	S. E.	4	S. E.	4	S.	3	19
6	Cir.	3	W.	8	Cir. st.	2	S. W.	W.	3	N. E.	1	S.	1	20
10	Cu. st.	3	N. W.	7	Cir. st.	3	N. W.	N.	3	N. W.	4	N. W.	4	21
1	Cir. st.	3	N. W.	9	Cir. st.	—	———	N. W.	4	N. W.	4	S.	0	22
10	Cir.	3	N.	1	Cir.	—	———	S.	0	N.	0	S. E.	2	23
1	Cir.	1	W.	1	St.	—	———	S. S. E.	2	W NW	2	S.	2	24
1	Cu.	2	N. W.	8	Cir. st.	1	N. W.	S.	2	N.	1	S. W.	0	25
10	Cir. cu.	2	S. W.	10	Cir.	2	W.	S.	1	S. S. E.	2	S. W.	3	26
2	Cir.	3	N. W.	9	Cu.	3	N.	S. S. E.	2	S. E.	3	S.	0	27
8	Cir.	3	W.	7	Cir.	2	W.	S.	0	N.	2	S.	0	28
1	St.	—	———	1	Cir.	2	N.	N.	2	N.	2	S. S. E	2	29
..	....	..	......	..	......	..	......	......	..	......	..	......	..	30
—	———	—	———	—	———	—	———	———	—	———	—	———	—	—

JULY, 1870.

Day of Month.	THERMOMETER IN THE OPEN AIR.				RAIN AND SNOW.				CLOUDS. 7 A. M.			
	7 A. M.	2 P. M.	9 P. M.	Mean.	Time of beginning of rain or snow.	Time of ending of rain or snow.	Amount of rain or melted snow, in inches.	Depth of snow, in inches.	Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds. Velocity.	Motion of higher clouds. Direction.
1	56.4	68.0	68.0	64.1	......	......	......	......	7	Cu.	2	N.
2	59.0	74.0	65.0	66.0	......	......	......	......	0	0	—	——
3	65.0	82.0	63.8	70.2	......	......	......	......	4	Cir.	1	S. W.
4	68.0	83.0	67.0	72.6	......	......	......	......	1	Cir.	1	N.
5	70.0	82.0	68.8	73.6	......	......	......	......	4	Cir.	1.	S. W.
6	73.0	84.0	68.0	75.0	......	......	......	......	2	Cir.	1	S. W.
7	68.8	85.0	74.0	75.9	......	......	......	......	5	Cir.	2	S. W.
8	78.0	77.0	64.0	73.0	Night.	Night.	.80	......	10	Cir. cu.	3	S. W.
9	67.0	75.0	64.0	68.6	......	......	......	......	0	0	—	——
10	72.0	82.0	72.0	75 3	......	......	......	......	1	Cir.	3	W.
11	82.0	80.0	71.0	77.6	......	......	......	......	1	Cir.	2	W.
12	69.3	79.0	79.0	75.7	6½ A.M.	4 P. M.	.15	......	10	Nim.	—	——
13	68.0	86.0	69.0	74.3	5 P. M.	......	.10	......	0	0	—	——
14	67.0	75.0	67.0	69.6	Night.	12½ PM	.23	......	10	Cu.	3	S. W.
15	67.5	75.0	62.0	68.1	......	......	......	......	0	0	—	——
16	62.0	80.0	72.0	71.3	7½ P.M.	......	......	......	0	0	—	——
17	71.0	82.0	70.0	74.3	......	6 A. M.	.20	......	10	Cu.	3	W.
18	77.6	87.0	72.5	75.7	......	......	......	......	5	Cir. st.	2	N. W.
19	72.5	84.0	70.0	75.5	......	......	......	......	1	Cir.	1	W.
20	68.0	84.0	72.4	74.8	6½ A.M.	......	.30	......	7	Cir. cu.	3	W.
21	72.0	80.0	68.0	73.3	......	7 A. M.	.35	......	10	Cir. cu.	2	W.
22	61.0	84.0	69.0	71.3	......	......	......	......	0	0	—	——
23	72.0	88.0	75.0	78.3	7 A. M.	8 A. M.	.05	......	10	Cu.	2	W.
24	80.0	94.0	74.2	82.7	3 A. M.	8 P. M.	.55	......	1	Cir.	—	——
25	75.0	83.0	71.0	78.3	Night.	Night.	.05	......	5	Cir. cu.	3	N. W.
26	70.0	84.0	76.0	76.6	......	......	......	......	0	0	—	——
27	61.0	77.0	63.0	67.0	......	......	......	......	1	Cir.	—	——
28	64.0	83.0	71.0	72.6	3 P. M.	9 P. M.	.30	......	4	Cir.	2	S. W.
29	70.0	85.0	67.0	77.3	1 A. M.	4 P. M	.30	......	10	Cu.	2	S. W.
30	65.0	72.0	61.0	66.0	......	......	......	......	10	Cu.	3	N. W.
31	60.0	83.0	70.0	71.0	......	......	......	......	1	Cir.	—	——
			Mn.	73.08		Sum s.	3.38					

JULY, 1870.

CLOUDS.								WINDS.						
2 P. M.				9 P. M.				7 A. M.		2 P. M.		9 P. M.		
Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds. Velocity.	Motion of higher clouds. Direction	Am't of cloud'n's.	Kind of clouds.	Motion of higher clouds. Velocity.	Motion of higher clouds. Direction.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day of Month.
0	0	—	———	0	0	—	———	N N E	1	N.	1	S.	0	1
1	Cir.	1	S. W.	4	Cir.	1	W.	S. E.	1	N N E	1	N N W	0	2
3	Cir. cu.	1	W.	2	Cir.	0	S.	S.	0	S.	1	S.	0	3
1	Cir.	1	S. W.	1	St.	—	———	S.	1	S.	1	S.	1	4
3	Cir. cu.	2	W.	1	Cu. st.	1	W.	S.	2	S.	3	S. S. E	0	5
5	Cir.	2	S. W.	1	Cir.	1	W.	S. W.	1	S. W.	0	S. E.	2	6
5	Cir.	2	S. W.	4	Cir.	2	S. W.	S. E.	2	S. W.	4	S.	3	7
7	Cu.	3	S. W.	4	Cu.	2	N. W.	S. W.	0	S. W.	2	S.	0	8
5	Cir.	3	N.	0	0	—	———	S. W.	0	W.	3	S.	2	9
10	Cu.	3	S. W.	2	Cir.	1	W.	S.	2	S.	3	W.	0	10
1	Cir.	2	S. W.	9	Cir.cu.	2	W.	S.	1	S. W.	2	S. S. E.	1	11
9	Cir. cu.	3	S. W.	8	Cir.	1	W.	S. S. E.	1	S.	3	S.	1	12
3	Cir. cu.	2	N. W.	9	Cu.	2	S. W.	S.	1	S. W.	0	S. E.	0	13
8	Cu.	3	W.	1	St.	—	———	S.	0	N.	0	N. W.	0	14
4	Cir.	3	N. W.	0	0	—	———	S. S. E.	1	W.	3	N. W.	0	15
2	Cir.	2	N. W.	10	Cu.	2	W.	S. S. E.	1	N N W	1	S.	0	16
3	Cir.	3	N. W.	4	Cir.	1	N. W.	S.	1	W.	3	S.	1	17
3	Cir. cu.	2	N. W.	1	Cir.	2	N. W.	S. W.	1	W.	2	E.	0	18
5	Cir.	1	W.	0	0	—	———	E.	0	N. W.	1	S.	0	19
10	Cir. cu.	2	W.	10	Nim.	—	———	S.	1	S.	3	S. W.	2	20
3	Cir.	3	N. W.	1	Cir.	—	———	S.	3	N. W.	3	N. W.	0	21
2	Cir.	2	S. W.	5	Cir. st.	1	S. W.	S. S. E.	2	S. S.E.	1	S.	0	22
4	Cir. cu.	3	N. W.	3	Cir.	—	———	S.	2	W S W	2	S.	1	23
2	Cir	2	W.	5	Cu.	3	N. W.	S.	2	S. W.	3	S. W.	1	24
4	Cir.	3	N. W.	1	Cir.	—	———	W.	3	W.	3	S.	2	25
3	Cir.	3	N. W.	10	Cu.	3	N. W.	S.	2	W.	3	W.	3	26
4	Cir.	2	N. W.	1	Cir.	—	———	N N W	2	N.	1	S. S. E.	0	27
10	Cu.	3	N. W.	4	Cu.	2	S. W.	S.	1	S.	2	S.	3	28
8	Cir. cu.	1	S. W.	5	Cir.cu.	3	N. W.	S.	2	S.S.W.	1	W.	3	29
8	Cu.	2	N. W.	0	0	—	———	W S W	3	W.	3	S.	0	30
5	Cir. cu.	2	W.	2	Cir.	2	W.	S.	2	W.	2	S.	0	31

Explanations.

The foregoing meteorological observations were registered at Newport, Vt., for the Smithsonian Institution, in latitude 44 degrees and 55 minutes North; longitude 4 degrees 40 minutes East from Washington; 750 feet above the sea.

Under the head of clouds the first, fifth and ninth columns of figures indicate the amount of cloudiness, which is estimated according to a scale from 0 to 10: 0 meaning entire clearness, 10 entire cloudiness, intermediate numbers so many tenths of the sky covered with clouds. The second, sixth and tenth columns of abbreviations indicate the kind of clouds, viz: *St.* Stratus; *Cu.* Cumulus; *Cir.* Cirrus; *Nim.* Nimbus; *Cir. st.* Cirro-stratus; *Cu. st.* Cumulo-stratus; *Cir. cu.* Cirro-cumulus; 0 no clouds. The third, seventh and eleventh columns of figures indicate the rate of motion, 10 being the highest and 0 apparent rest. The —— indicates that the observation was made, but the motion or direction could not be determined.

Under the head of winds, the figures in the second, fourth and sixth columns indicate the force of the wind according to the following scale of numbers:

1	represents a	very light breeze	2	miles	per hour.
2	"	gentle breeze	4	"	"
3	"	fresh breeze	12	"	"
4	"	strong wind	25	"	"
5	"	high wind	35	"	"
6	"	gale	45	"	"
7	"	strong gale	60	"	"
8	"	violent gale	75	"	"
9	"	hurricane	90	"	"
10	"	most violent hurricane	100	"	"

The thermometer used was Fahrenheit's.

NEW MOUNTING
FOR
MICROSCOPIC OBJECTS.

By HIRAM A. CUTTING, A. M., M. D.,

LUNENBURGH, VERMONT.

After many experiments with Brunswick black, gold size, &c., as well as the various varnishes used for that purpose, I find in zinc white mixed with Damar varnish, a substitute in every way adapted to the purpose. Some of its advantages are that in mounting in glycerine, a circle may be made with the prepared paint on the slide which partially dries in a short time. Then put a drop of glycerine within this circle, mounting in the usual way, pressing the cover down firmly upon the ring of thin paint where it will closely adhere. It will not cloud the glycerine, and you can finish at your leisure. In mounting in gelatine or balsam you can mount in the same way if you choose, if not the paint will not run under the glass cover as the Brunswick black is apt to do. This varnish and zinc white will become very hard when dry, and will adhere so firmly to the glass that you cannot separate it without much difficulty, instead of its cracking off as is frequently the case with the Brunswick black. It will not crack at any temperature; and further, the object may be finished up at once; striped with red, blue, or any other color, which will give it a finished look, and after two or three days it will be safe in any position. These advantages, together with great durability, should, I think, recommend it to all.

The zinc paint mixed and sold as Italian or Florence white, thinned with Damar varnish is the finest and best for use.

INJECTION OF ANIMAL TISSUES.

In making injections of animal tissues, after they have parted with their natural warmth, I find the operation much facilitated by soaking the same in a solution of carbolic acid and water, with a temperature a little above blood heat. It gives an elasticity to the vessels so that the injection can be forced into the smallest capillaries with ease. I use one part carbolic acid to one hundred parts of water, letting the part to be injected lay in the solution until it has become blood warm. Then inject in the usual manner.

◆

TWO
DISTINCT MAPLE TREES
UNITING PERFECTLY
AND FORMING ONE COMMON TRUNK.

REPORTED BY THE SENIOR EDITOR.

Standing on the side-walk in front of Rev. Geo. H. Bailey's residence, in Newport, Vt., is a curious maple tree, (*acer saccharinum.*) It starts from the ground by two distinct, and well formed trunks, proceeding upwards three and three fourths feet, they unite, forming one straight trunk over twenty-five feet in height. Only a few small branches are given off except at the top where there are several large ones. The common trunk at the top appears to be at least two-thirds the size of that, one foot above the union; it is round and smooth, excepting several places where efforts were made by nature to heal over decayed branches; the same may be said of the two lower trunks. The union is so perfect that the bark is as smooth nine inches above as at any part of the tree, although there are slight faults by means of which the union can, by stretch of imagination, be made out. It is clear that both trunks, one being smaller than the other, help form the common trunk in proportion to their size.

The following measurements were made several days since by myself with great care: East trunk: circumference three inches from the ground, fifteen and one-fourth inches; three inches below the union, thirteen and three-fourths inches. West trunk: circumference three inches above the ground, eleven and one-half inches; three inches below the union, ten and three-fourths inches. Common trunk: circumference three inches above the union, twenty and one-half inches; eighteen inches above the union, seventeen and one-fourth inches. Distances between the east and west trunks: three inches above the ground, three inches; three inches below the union, one and six-tenths; one-half way between the two measurements, three and three-fourths inches. Height of union above the ground, three feet and nine inches.

This singular tree was found in Coventry, Vt., on the farm of Harvey Hammond. Mr. Bailey who has an appreciative eye for natural curiosities, had it dug up and brought to its present location in the spring of 1868, with great care and considerable expense. The tree is now (1870) growing well.

Editorial Department.

We present to our readers the first number of the ARCHIVES OF SCIENCE. We have been delayed in its publication by numerous unforseen hindrances, which will not be likely to occur with future numbers. We have met with encouragement from almost every quarter. and we hope to receive assistance from every scientific man in the State.

This journal will be issued quarterly, containing sixty-four octavo pages with all necessary illustrations; it will be made up of original articles upon all scientific subjects, especially giving the results of original observations and researches respecting scientific matters of the State, although it will be open to subjects, outside the State, by Vermont men.

The Science of Entomology is one which needs to be cultivated in this State, and special efforts will be made to encourage its study, and we would request all newspaper editors to mention this fact when they notice this work. There is no subject which so directly concerns the Agriculturist as this—no one which so much needs to be studied by him, yet how little pains he takes to inform himself respecting the nature and habits of insects.

A part of the work will contain the Transactions of the Orleans County Society of Natural Sciences, giving the results of the labors of that scientific body, that will be of any interest to science.

When we started this publication we expected to give extracts from other journals, of such matters as would interest the readers of Vermont, but have since concluded to shut out every thing but original matter, giving only occasional notices of new and worthy publications.

New Publications.

THE ANATOMY OF THE BLOW-FLY (*Musca Vomitoria. Linn.*) A Monograph by Benjamin Thompson Lowne, M. R. C. S., England. Illustrated with ten plates.

This work has been brought forth with wonderful precision and accuracy. It embraces 121 pages with ten plates on copper, executed by the author himself, and colored.

Plate I, facing the title page, shows the general form and structure of the Fly. Plate II represents the hard parts of the head and proboscis. Plate III represents the right half of a vertical section of the proboscis, showing the relations of its component structures. Plate IV represents the alimentary canal. Plate V exhibits the various structures of the thorax. Plate VI illustrates the development and appendages of the thorax. Plate VII represents the sympathetic nerves and ganglia, also some of the structures of the eye. Plate VIII represents other structures of the eye, also parts of the antennæ. Plate IX represents the various parts of the abdomen. Plate X represents the organs of generation.

This is a very valuable acquisition to entomological science, and great praise is due Mr. Lowne for his extensive researches and for the neatness, clearness and erudition which characterizes the work. The advanced student in comparative anatomy and physiology has, in this work, not only a convenient manual, but the most elaborate treatise on the subject. New facts are brought to light, old ones confirmed, and errors corrected.

WINTER AND SPRING ON THE SHORES OF THE MEDITERRANEAN: or, the Riviera, Mentone, Italy, Corsica, Algeria, Spain and Biarritz as winter climates, by J. Henry Bennet, M. D., member of the Royal College of physicians, London, &c., &c., &c. Fourth edition, published by D. Appleton, & Co., 90, 92 and 94 Grand Street, New York.

The author of this work was an over worked London practitioner, suffering from pulmonary consumption, and sought some quiet corner in which to die. The shores of the Mediterranean were selected and he arrived there in the autumn of 1859, where he resided ten winters, and almost completely recovered his health, greatly to the surprise of his friends and himself. He has written this work with a view of showing the adaptation of its climate and physical condition of the country to consumptive patients. He gives the physical geography, geology and botany of the Mentonian amphitheatre, and several important places along the shores of the Mediterranean. The results of his meteorological observations are also given, together with a description of the manners and customs of the inhabitants; considerable historical matter is also added. Mention is made of several caves near Mentone, in which were found bones of various animals, shells, remains of crustacea, stone, arrows, lance heads, spear points and pieces of flint, which were considered by many of the most able geologist of the world, to prove the existence of a pre-Adamite race of human beings.

The work contains much that is of scientific interest, and can be read by every one with profit. It reaches 621 pages, besides several plates, maps and cuts, which form no unimportant feature in the work.

TRANSACTIONS

OF THE

ORLEANS COUNTY SOCIETY

OF

NATURAL SCIENCES.

Incorporated Nov. 10. 1869.

PUBLICATION COMMITTEE:

Hon. J. L. EDWARDS, Derby, Vermont,
Rev. J. G. LORIMER, Derby, Vermont,
J. M. CURRIER, M. D., Newport, Vermont,

ACT OF INCORPORATION.

AN ACT TO INCORPORATE THE ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

It is hereby enacted by the General Assembly of the State of Vermont:

SECTION 1. That Lemuel Richmond, George Henry Bliss, J. E. Dickerman, H. A. Spencer, E. P. Colton, J. M. Currier, David M. Camp. 2d. M. H. Fuller, Royal Cummings, George A. Hinman, Alfred Randall. Lewis H. Bisbee, John L. Edwards, and others, who have heretofore formed an association in Orleans County styled the Orleans County Society of Natural Sciences, having for its object the advancement of science and the establishment in said County of a museum and library for the illustration and study of its various branches, their associates and successors, are hereby declared and created a body corporate by the name and style aforesaid; and by that name they shall have perpetual succession, may sue and be sued, implead and be impleaded in all courts of competent jurisdiction, may acquire by purchase, gift or devise, receive and hold property real, personal or mixed, and the same exchange, sell, lease or otherwise dispose of, as they may deem proper for the objects and purposes aforesaid, and not otherwise; may have a common seal and break or alter the same at pleasure, and may make such constitution, regulations and by-laws as may be requisite for the government thereof, not being contrary to the laws of the land, and may alter the same at pleasure.

SECTION 2. The constitution and by-laws of said association now in operation shall govern the corporation hereby created until the same shall be regularly altered or repealed, and the present officers of said association shall be officers of this corporation until their respective terms of office shall expire or be vacated in pursuance thereof.

SECTION 3. The property and effects now belonging to the association aforesaid shall, on acceptance of this charter, thereby become vested in the corporation herein created, and all property owned or held by this corporation shall be exempt from taxation, so long as the same shall continue to be held and used in good faith for the objects and purposes aforesaid: but whenever any real estate of the corporation shall be leased to any other person or persons, the leasehold interest therein shall be taxable to the lessee or lessees thereof, as in other cases.

SECTION 4. The members of this association shall acquire no individual property in the real estate, cabinet, library or other effects thereto belonging, which are hereby declared to be fully vested in the corporation as such, but the interest of the members therein shall be usufructuary merely, and shall not be transferred, assigned, hypothecated, or otherwise disposed of, than as hereinbefore provided.

SECTION 5. This act shall not be operative until all persons who have heretofore formed the Orleans County Society of Natural Sciences shall have assented thereto in writing, and the instrument of assent shall be recorded in the records of the corporation.

SECTION 6. This act shall be taken to be a public act, shall be subject to the control of future legislation, and shall take effect from its passage.

Approved, November 10, 1869.

ACCEPTANCE OF THE CHARTER

BY

THE MEMBERS.

We, members of the Orleans County Society of Natural Sciences, who formed said Society previous to November 10, 1869, do assent to the Act incorporating said Society, passed by the General Assembly of the State of Vermont, November 10, 1869.

[Signed by]

J. M. CURRIER,	Feb. 25, 1870.
S. W. DANE,	Feb. 25, 1870.
R. CUMMINGS,	Feb. 25, 1870.
W. D. CRANE.	Feb. 26, 1870.
M. H. FULLER,	Feb. 26, 1870.
J. F. WRIGHT,	Feb. 28, 1870.
N. CHENEY.	March 1, 1870.
GEO. S. KELSEA,	March 4, 1870.
L. H. BISBEE.	March 5, 1870.
D. M. CAMP, 2d,	March 5, 1870.
D. GOODHUE.	March 8, 1870.
GEO. A. HINMAN.	March 8, 1870.
J. C. RUTHERFORD,	March 8, 1870.
JOSIAH GROUT, Jr.,	March 15, 1870.
J. E. DICKERMAN,	March 29, 1870.
H. A. SPENCER.	April 5, 1870.
H. FAIRCHILD.	April 13, 1870.
CHARLES I. VAIL,	April 14, 1870.
ALFRED RANDALL,	April 21, 1870.
GEO. HENRY BLISS,	April 27, 1870.
J. L. EDWARDS,	April 30, 1870.
L. RICHMOND.	May 10, 1870.
E. A. STEWART,	May 10, 1870.
T. E. RANNEY.	May 10, 1870.
A. A. SMITH,	May 10, 1870.
D. W. BLANCHARD.	May 13, 1870.
J. G. LORIMER,	May 26, 1870.
H. D. HOLMES,	May 30, 1870.
JOHN A. BOWKER,	June 15, 1870.
E. P. COLTON,	July 12, 1870.

CONSTITUTION.*

ARTICLE I.

This Society shall be called the ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

ARTICLE II.

It shall consist of four orders of members, to wit: ACTING, ASSOCIATE, CORRESPONDING, and HONORARY MEMBERS.

ACTING MEMBERS. To become an Acting member, the candidate shall be a resident of Orleans County, and shall be elected by ballot; the affirmative votes of a majority of the members present shall be necessary to a choice.

ASSOCIATE MEMBERS. Associate members shall be *non residents.* Their election shall be similar to that of Acting members; and they, as well as Corresponding members, shall be classed as Acting members in case of their removal to this County.

CORRESPONDING AND HONORARY MEMBERS. Corresponding and Honorary members shall also be elected by ballot, but the affirmative vote of *three-fourths* of the members present shall be necessary to their election.

ARTICLE III.

VOTERS. Acting members only shall be entitled to vote, to hold office, or to transact business; Corresponding and Honorary members may attend the meetings, and take part in the scientific discussions of the Society.

ARTICLE IV.

Every Acting and Associate member upon signing the obligation prescribed in Chapter 1 of the By-Laws, and paying an admission fee of two dollars,—and all other members upon their election,—shall receive a Diploma under the Seal of the Society, in the following form, to wit:

---

* This Society has adopted the Constitution and By-Laws of the Portland Society of Natural History, which seemed the best adapted to its circumstances, a few changes only being made.

ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

Be it known : That——————is a——————member of the ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

In testimony whereof this Diploma is issued, signed by the President and Secretary of the Society, and its Corporate Seal affixed, at Derby, in the State of Vermont, U. S. A., this——day of——A. D. 18—

——————, President. [Seal.] ——————, Secretary.

ARTICLE V.

OFFICERS. The officers of this Society shall be a President, two Vice Presidents, a Secretary, a Treasurer and an Auditor. The four first named officers together shall manage the concerns of the Society, and shall be called the Council.

ARTICLE VI.

THE ELECTION OF LIBRARIAN AND CURATOR. The Council shall annually elect from the members of the Society, a Librarian, and as many Curators as they shall deem expedient, who shall be entrusted with the care of the Library and Cabinet.

ARTICLE VII.

OFFICERS, HOW CHOSEN. All officers shall be chosen by ballot, and a majority of votes shall be sufficient for a choice.

ARTICLE VIII.

The common Seal of the Society shall bear as a devise, a landscape, a waterscape, an evergreen tree, and a beaver bearing a branch to the water, surrounded by the title of the Society, and the date of its incorporation.

ARTICLE IX.

BY-LAWS. By-Laws for the more particular regulation of the Society shall be made from time to time.

ARTICLE X.

ALTERATIONS OR AMENDMENTS. This Constitution may be altered and amended in any of the preceding articles at any regular meeting by a vote to that effect of three-fourths of the members present ; such alterations or amendments having been presented in writing at a previous regular meeting: but the article which immediately follows this shall be unalterable.

ARTICLE XI.

DISSOLUTION. The consent of every member shall be necessary to a dissolution of the Society. In case af a dissolution, the property of the Society shall be given to Derby Academy, or if it should not exist, to the most flourishing Academy in the County, on such conditions as may be agreed upon; and the faithful performance of such conditions shall be secured by bonds with sufficient penalties for the non-fulfillment thereof.

BY-LAWS.

CHAPTER I.

MEMBERS.

SECTION 1. The following obligation shall be signed by all Acting and Associate members elect, within four months after their election, and it shall be the duty of the Secretary to present the same for signature. Neglect to sign the obligation when thus presented, or to pay the admission fee, shall render such election null and void, if so declared by a majority of the members present at any regular meeting.

OBLIGATION OF MEMBERS.

In becoming a member of the Orleans County Society of Natural Sciences, I promise to conform myself to its Constitution, Laws and Regulations; in testimony whereof I do hereunto subscribe my name.

SECTION 2. Corresponding and Honorary members shall not be required to pay an initiation fee or any assessments.

SECTION 3. If any person shall be balloted for, and rejected, or his name withdrawn previous to the ballot, no note of such rejection or withdrawal shall be made on the records of the Society.

SECTION 4. Any member may withdraw from the Society by giving written notice of his intention, and paying all arrearages due from him.

SECTION 5. Members may be expelled from the Society, by a vote of three-fourths of the members present, at a meeting specially called for the purpose, by a notice given at least one month previous, and served personally upon the accused member.

CHAPTER II.

OFFICERS AND THEIR DUTIES.

SECTION 1. At all meetings of the Society and of the Council, the President, or in his absence the first Vice President, or in the absence of both, the second Vice President, or in case all are absent, a member chosen for the occasion, shall preside. He shall preserve order, regulate debates, announce donations, and generally introduce all other subjects of interest to the Society. He shall call special meetings of the Society at such times as he may deem necessary, or at the request in writing of five members.

SECTION 2. It shall be the duty of the Secretary to take and preserve correct minutes of the proceedings of the Society and Council ; to notify all Acting, Associate, Corresponding and Honorary members of their election, and to keep a correct list of the members of the Society, with the date of their election, resignation or death ; to have charge of the papers and documents and of the common seal of the Society ; to notify meetings when directed by the President, and acknowledge donations ; to conduct the correspondence of the Society ; shall also keep correct copies of all letters written on the business of the Society.

SECTION 3. The Treasurer shall take charge of the funds of the Society ; attend to the collection of all fees and assessments, and receive all donations in money or other securities which may be made to it ; pay all accounts against the Society, when the same are approved by the Auditor ; he shall have care of the certificates of membership duly signed, which he shall deliver to Acting or Associate members elect upon the payment of the admission fee. He shall keep a correct account of all receipts and expenditures in a book belonging to the Society, and shall at each annual meeting, and at other times when required by the Council, make a detailed report of the same.

SECTION 4. The Librarian shall take charge of all books belonging to the Society, or deposited for their use under the rules prescribed in Chapter IV. ; he shall make a correct catalogue of them, and keep a record of all donations to, or deposits in, the library, and of such books as are borrowed from the library by the members, which record and catalogue shall always be open to the inspection of the members ; and shall permit the use of the library to members only, and such other persons as the Council may delegate, under such regulations as may from time to time be adopted ; and shall annually report the condition of the library. It shall be his duty also to attend at the library room on such days and at such times as the Council shall direct.

SECTION 5. The Curators shall be entrusted with the care of the museum. Each Curator shall be charged with the safe keeping and arrangement of the department to which he may be specially appointed, and shall keep the key thereof. He shall arrange the specimens after some approved system, and so far as is practicable, label them with the names they bear in such system. The Curators shall keep a correct catalogue of articles in their care, and shall be alone authorized to select duplicate specimens from the cabinet, and effect exchanges. At the annual meeting, or whenever the Council requires, they shall individually report to the Society the condition of their several departments, the additions made during the year, and the deficiencies which exist.

SECTION 6. The Council shall have the general charge of the building belonging to the Society, or one which the Society may lease ; shall see that its contents are kept in the best order, and may select a competent person, if necessary, as a Janitor or attendant, who shall be under their immediate control. They shall report on what repairs are necessary and see that they are properly executed ; shall provide for the accommodation of the Society and its museum, also for public lectures when such shall be determined upon ; shall appoint the lecturers and arrange their compensation ; shall regulate the order in which the lectures shall be given, and the terms upon which the public may be admitted to them ; shall authorize all expenditures of money for the increase of the museum ; and generally shall do any and all other acts not specially provided for in the Constitution and By-laws, and which are not inconsistent with the same, and which they may think necessary to the continuation and success of the Society.

SECTION 7. It shall be the duty of the Auditor to examine all bills, and if correct give an order on the Treasurer for the amount ; examine the Treasurer's books and accounts ; keep correct minutes of their proceedings, and report at the annual meeting in each year.

CHAPTER III.

COMMITTEES AND THEIR DUTIES.

SECTION 1. At the annual meeting of the Society, the President shall appoint twelve Standing Committees, each to consist of three members, whose term of service shall be one year, viz:

1. Committee on Ethnology.
2. Committee on Comparative Anatomy and General Zoölogy.
3. Committee on Mammalogy.
4. Committee on Ornithology.
5. Committee on Herpetology and Ichthyology.
6. Committee on Invertebrata.
7. Committee on Entomology.
8. Committee on Botany.
9. Committee on Paleontology.

10. Committee on Geology and Mineralogy.
11. Committee on Library.
12. Committee on Publications.

The Curators shall always be Chairmen of the Committees on their respective departments.

SECTION 2. All Committees must report in writing; and every report must be signed by a majority of the Committee offering it.

SECTION 3. The Committee on Publications shall conduct all publications of the Society under the rules prescribed in Chapter VI., and shall report to the Society at the annual meeting in each year.

CHAPTER IV.

LIBRARY.

SECTION 1. The Library shall consist of works on NATURAL HISTORY, and other subjects connected therewith.

SECTION 2. All books in the library must be classed according to their subjects.

SECTION 3. The President, first Vice President and Librarian, shall constitute the Library Committee. They shall have a general supervision of the library, negotiate all exchanges of duplicates, keep a correct list of all additions to the library, recommend such additions as they may deem important, and report the condition of the library at the annual meeting in each year.

SECTION 4. The Librarian alone shall keep the keys of the cases containing the books, and shall at such times as the Council may appoint, open the library for the use of the Society.

SECTION 5. Members or others may deposit books in the library for the use of the Society, and may if they choose, prohibit their removal from the library rooms.

SECTION 6. Members may borrow books, property of the Society, from the Librarian, on such conditions as the Council may from time to time establish.

SECTION 7. No member shall be allowed to take from the library more than one book at any one time, and this may be retained one month and no longer. When, on account of any particular investigation or study in which a member may be engaged, any deviation from this law is desirable, the written consent of two or more of the Library Committee shall be obtained.

SECTION 8. The Library Committee may specify and designate by the word "Retineatur," certain books which shall on no account be taken from the library.

SECTION 9. No member shall be allowed to renew the loan of a book, if any other member shall express to the Librarian, in writing, his desire of obtaining it.

SECTION 10. The Library Committee shall be responsible for all library property entrusted to their charge, unless exonerated by the Society.

CHAPTER V.

THE MUSEUM.

SECTION 1. The Cabinet shall consist of collections in the different departments of Natural History.

SECTION 2. All specimens sent to the cabinet shall be considered the property of the Society, unless the owner shall make known in writing, his wish to retain the privilege of withdrawing them.

SECTION 3. The names of donors, with the articles given, shall, in every instance, be recorded in a book kept for that purpose by the Curators of each department.

SECTION 4. No specimen of Natural History contained in the collections of the Society shall be lent from the museum under any pretence or for any purpose whatever, unless by the consent of a majority of the Council, or for the purpose of exchange under the direction of the Curators.

SECTION 5. Acting, Associate, Corresponding and Honorary members shall have access to the Cabinet, at all times, subject to the regulations established by the Council.

SECTION 6. Strangers may be admitted to the museum and the meetings of the Society by invitation of, and in company with, any member of the Society.

SECTION 7. Members desirous of examining or describing specimens, or taking them from the cases, for the purpose of study, must apply to the Curators who have them in charge.

SECTION 8. The museum of the Society shall be open to the gratuitous admission of the public at such times and on such occasions as the Council may specially direct.

SECTION 9. Every donation to the museum shall be referred to the standing committee of the department in which it may be classed; in case of doubt on this point, or when from other causes such references cannot be made, such donation shall be referred to a special committee, whose duty it shall be to report thereon at the next regular meeting of the Society.

CHAPTER VI.

PUBLICATIONS.

SECTION 1. All papers read before the Society shall first be referred to the Committee upon the department to which they refer, or to such special Committee as the case may require; and if deemed to be of sufficient importance, shall be placed in the hands of the Committee of Publications.

SECTION 2. The Committee of Publications shall receive all such papers as have been pronounced worthy of publication by the several Standing or Special Committees; and shall, if expedient, cause them to be published as early as possible, in the form prescribed in Section 3 of this Chapter, and shall follow in publication as far as possible the order in which they have been received.

SECTION 3. All publications of the Society shall be issued in pamphlet form, of uniform size, entitled "Transactions of the Orleans County Society of Natural Sciences."

SECTION 4. The proof sheets of all papers accepted by the Committee for publication shall be submitted to the author, if requested, for correction.

SECTION 5. Every author shall be entitled to an extra copy of the number or numbers in which his papers appear, and on timely application to the Committee, he shall be entitled to twenty extra copies of his paper at the Society's expense.

SECTION 6. The Society shall be responsible for the cost of all its publications.

SECTION 7. The Chairman of this Committee shall take charge of all papers reported for publication; keep an account of the number of publications printed, of the number presented, and to whom presented, and of those sold, and on hand; he shall also keep a correct account of the money transactions of the Committee, receive all moneys arising from the sale of the publications, pay all bills for the publications from such receipts, if sufficient, and deposit any surplus proceeds with the Treasurer.

SECTION 8. The Publication Committee shall be authorized to exchange the publications for any work which they may deem of sufficient value.

SECTION 9. No copy of the publications shall be presented to any individual or society, except by the special resolution of this Society.

SECTION 10. All communications read before the Society, intended for publication, become the property of the Society, and shall be deposited in the archives after publication; a copy, however, of any such paper may be taken by the author; but all written communications, which shall not be deemed fit for publication, may be returned to their authors if duly requested.

CHAPTER VII.

ASSESSMENTS.

SECTION 1. Every Acting and Associate member elect shall pay to the Treasurer an admission fee of two dollars.

SECTION 2. Every Acting member of this Society shall pay an annual assessment of one dollar; and any member who shall neglect to pay the Treasurer of the Society any such assessment for the space of six months from the time he is notified that the same is due, shall by a vote to that effect at any regular meeting of the Society, be deprived of all rights and privileges of membership.

SECTION 3. Any member who shall pay into the Treasury at any one time the sum of Twenty dollars, shall be exempt from annual assessment.

SECTION 4. The Society may, as a mark of distinction, exempt any member elect from his assessments, or may do so as an equivalent for any donation of sufficient value, provided propositions for these purposes be made at any regular meeting, and a vote of three-fourths majority be obtained.

SECTION 5. Every member who shall be absent from the County for one or more years may be exonerated from the payment of his dues accruing during his absence.

SECTION 6. All Acting members removing permanently from the County shall become Associate members.

CHAPTER VIII.

MEETINGS.

SECTION 1. The annual meeting of the Society for the election of officers and reports of committees, shall be holden on the second Tuesday of September, at 10 o'clock A. M., at the Hall of the Society.

SECTION 2. Regular meetings of the Society shall be holden on the second Tuesday of November, January, March, May, July and September at one o'clock P. M., for scientific and business purposes, and at such places as the Society may determine upon at each preceding meeting, excepting the meeting in September, which shall be holden at the Hall of the Society. In case the Society fail to determine the place of holding regular meetings, they shall be holden at the Society's Hall unless otherwise ordered by the Council.

SECTION 3. Special meetings of the Society may be convened by resolution of the Society, or by public notice from the President, or in his absence the first Vice President, or in his absence the second Vice President, or at the request of five members.

SECTION 4. At all meetings of the Society five members, and of the Council three members, shall constitute a quorum.

SECTION 5. Members will be expected to communicate at the meetings of the Society, such interesting information as may come into their possession respecting Natural History in general, and particularly any new facts respecting our own County

SECTION 6. Written communications on subjects connected with Natural History may be made by members: the subjects and time of reading shall be chosen by themselves: but after the same have been read, the opinions and facts therein contained shall be opened for discussion.

SECTION 7. The order of proceedings at regular meetings shall be:

1. Minutes of the last meeting shall be read.
2. Written communications.
3. Verbal communications.
4. Donations announced.
5. Business called up by special resolution.
6. Rough minutes read.
7. Deferred business.
8. New business.
9. Adjournment.

SECTION 8. The order of proceedings at the annual meeting shall be:

1. Minutes of the last annual meeting shall be read.
2. Election of officers.

3. Reports of Committees.
4. Secretary's report.
5. Auditor's report.
6. Business.
7. Adjournment.

SECTION 9. At the opening of the session in the afternoon of the annual meeting, the officers elected for the ensuing year shall enter upon their new duties.

SECTION 10. All meetings must be noticed, either by sending written or printed notices to each member, or having them published in one or more of the County papers one week at least previous to the meeting.

CHAPTER IX.

MISCELLANEOUS.

SECTION 1. In all such points of order as are not noticed in these By-laws, the Society is to be governed by the established usages of similar institutions.

SECTION 2. These By-laws shall not be altered, amended or repealed, unless by a vote of two-thirds of the members present at any regular meeting, such alterations or amendments having been presented in writing at a previous regular meeting.

SECTION 3. No one or more of the By-laws of the Society shall be suspended.

SECTION 4. When any donation in money shall be made to the Society, the donor may designate the special object to which the same shall be appropriated, and the terms of its expenditure: and if accepted, the Society shall comply with the terms and conditions of such donation.

SECTION 5. The officers of this Society shall remain in office until others are chosen, in case there should be a failure of an election.

OFFICERS.

COUNCIL.

GEO. A. HINMAN, M. D., President.
Rev. H. A. SPENCER, First Vice President.
E. P. COLTON, Esq., Second Vice President.
J. M. CURRIER, M. D., Secretary.

D. M. CAMP, 2d, Treasurer.
GEO. HENRY BLISS, Auditor.
Hon. E. A. STEWART, } Curators.
M. H. FULLER, A. B., } Curators.
M. H. FULLER, A. B., Librarian.

ARCHIVES OF SCIENCE.

Vol. I. JANUARY, 1871. No. II.

NOTES
ON THE
FLORA OF VERMONT.

By GEO. H. PERKINS, Ph. D.,

Professor of Zoölogy, Botany and Geology, in the University of Vermont.

The fields, meadows and groves of Vermont afford a flora of very great richness and beauty, interesting to every one that loves flowers and plants, but especially so to the scientific botanist who not only admires the outward form and beauty of a plant, but derives a deeper joy from an investigation of its mode of growth, structure and economy.

In the cold bogs and shaded ravines and hillsides of the northern portion of the state we find Canadian and other northern plants quite abundantly mingled with the more southern vegetation, and all over the state there are many regions where this union of the two floras occurs to a greater or less extent. Besides this, on the summits of Mansfield and other of our highest mountains, Alpine plants are found, with small and rough looking forms indeed, but bearing delicate flowers, and in contrast with the barrenness about them, appearing more delightful than many luxuriant forms that grow in more favored localities.

The state produces many valuable trees and it is a disagreable fact that in many parts of the state their value is appreciated only so far as it is represented by the dollars and cents paid at the saw-mill. Should the present ruthless destruction of our forests continue, the time will come when the *Green* Mountains will be but bleak and barren elevations, hurling landslides and torrents upon the property of those beneath them. This is not the place to treat of this subject, but it is difficult to pass it without a word of remonstrance against the present thoughtless cutting away of trees.

Growing high on the mountain sides, with scarcely any soil but rock, we have the Pines, Firs, Spruces and others of the Coniferæ. These also flourish on sandy plains and other barren regions where scarcely any other tree or plant can live at all. There are a dozen species of this family in the state, all of them valuable for timber and many for ornamental purposes, while they render no small service in holding in place the loose soil in which they so often grow, and so prevent it from falling down steep descents in landslides, or from being washed away by rains and freshets and spread over cultivated fields.

Bordering the banks of the larger streams we find the Silver Maple (*Acer dasycarpum*), Red Maple (*A. rubrum*), smooth-barked, Ash-leaved Maple (*Negundo aceroides*), the curious corky Elm (*Ulmus racemosa*), with its branches winged with broad, thin ridges of fine, brittle cork, caused by a great development of the cork layer of the bark; the American Elm (*U. americana*), with its rounded top and long sweeping branches, one of our noblest trees; the Hornbeam (*Carpinus americana*), the Buttonwood or Sycamore (*Platanus occidentalis*), and the many kinds of Willows and Poplar. These trees make up the greater part of the vegetation that forms billowy lines of green along the rivers or scattered over moist meadows. The underbrush along the streams consists of the smaller Willows, Alders, Witch Hazels, Hawthorns, Juneberry, Dogwood and many shrubs and small trees. Many of these are never, or very rarely, cultivated, and yet some of these neglected ones would most richly repay care bestowed upon them, for they are beautiful both in leaf and flower.

On somewhat dryer soil grow the trees that form our rich woods, especially upon the lower hillsides. Among these the most common are the Sugar Maple (*Acer saccharinum*), which is one of the largest of all; the Beech, the various Oaks and the different species of Ash and Birch, with a sprinkling of Hickory, Pignut, Basswood, and bordered with Butternut, Red Mulberry, Sassafras and others less common.

In the swamps the Larch or Hackmatack (*Larix americana*) is usually most abundant, but with it the Hemlock, Spruce and Balsam Fir are usually seen. The White or Paper Birch (*Betula papyracea*), with one or two varieties grows in all kinds of soil and situations, though some are better suited to it than others. It is found occasionally among the swamp trees and in the hill forest, and even covers wide patches on the mountain sides, growing in friendly nearness to the coniferous pines and spruces, and sending now and then a straggler to the very top of some of the highest summits.

The species of small shrubs and herbs are very numerous. From the latter part of April when the southern slopes are fragrant with the exquisite clusters of the Trailing Arbutus or May Flower (*Epigæa repens*), till late summer all the fields and woods are profusely adorned with flowers of varied form and color, but all most beautiful. In June the large, snowy Trillium may be found covering moist, shady banks with its superb wax-like flowers, and often with this, though usually in dryer situations, grows the painted Trillium and the large purple Trillium, with a fourth species bearing smaller, nodding, white flowers. These are the most showy of all our early flowers, and well deserve a place in the finest garden. The first named and finest of these is found in no other of the New England states. Passing many interesting families of plants well represented in the state, we will notice only a few of the most important and larger ones. The moisture-loving Ranunculaceæ are abundant all over the state, and some of the rarest species are found here. One of these, the very rare Atragene, grows over rocky hillsides shaded by larger growths, and in May bears its large, drooping flowers on their slender peduncles. Blossoming later and very much more common, we have the white-flowered Clematis (*C. virginiana*). Late in the fall this may be seen twining about the branches of alders and other shrubs by the sides of almost every stream and waving its plumed seed-vessels in every breeze. Both of these vines are easily cultivated. Quite a number of species of Anemone are found in the state; most of them grow in rocky, dry soil and blossom all summer. The Cowslips are very abundant in some meadows and carpet them with golden yellow, while the Buttercups are as plenty in pastures and along roadsides. The pretty and delicate flowers of the Dielytra family (*Fumariaceæ*) grow in many of our woods and rocky fields. In early spring the Dicentras or squirrel corn, as they are sometimes called, spring up in open woods and very soon produce beautiful wands of flowers, while in mid-summer the golden yellow and the flesh-colored Corydalis, half supported by some friendly rock, lift their faces to the sun and still later and more rare than all is the elegant Adlumia, twining gracefully over the rocky sides of some ravine and bearing long, pendant clusters of rose-white flowers — the most beautiful of all our fall vegetation.

There are many of the Violets, some of which blossom very early, others later and others during all the season. At almost any time, from early spring until the snow comes, one may find either a white, yellow or purple flower of this family. The great rose family has numerous representatives among us. We have different kinds of Blackberry, Raspberry, Hawthorn, Wild Rose and Cherry, as well as hosts of smaller species. Another largely represented family is that to which the Heath belongs, the Ericaceæ. Some, as the Kalmias, the mountain and sheep Laurel, the Blueberries and others, grow in dry soil, on rocky hills and in open fields; others, as Cassandra, Andromeda, Labrador Tea and many species of Blueberry, Huckleberry and Snowberry, delight in swampy ground, and the Pyrolas and indian pipe or Monotropa in moist woods, while yet others, as the Wintergreen, grow almost anywhere. A few species of this group are found, so far as this state is concerned at least, only on or near the tops of our higher mountains, as the bog Bilberry and two or three others like it. The Bean family (*Leguminosæ*), Mint family (*Labiatæ*) and Figwort family (*Scrophulariaceæ*) are each represented by about thirty species, while the Cresses (*Cruciferæ*) and Knot-Grasses (*Polygonaceæ*) have nearly as many. After the first of August the members of the Sunflower family (*Compositæ*), which before are not very numerous in species, though some, as the Dandelion and Daisy are very abundant in individuals, now come in full force to take possession of the fields and roadsides, and everywhere hosts of Asters, Goldenrods, Thistles and others wave their many-flowered heads in defiance of all attempts to destroy them. There are over a hundred species of this family in the state, and many of them are known as most troublesome weeds, as they are not easily killed, spread very rapidly and grow luxuriantly.

A family which perhaps embraces more grotesque and strange forms of flowers than any other is called Orchidaceæ. This, which besides being a singular group, is a most beautiful one, is found, in some of its species all over the state, and we find some very rare forms. Most of these plants grow in damp woods or in swamps. In the latter place, quite early in the summer, we find the large, purple Orchis or Lady's Slipper (*Cypripedium acaule*) lifting its large, sac-like flowers under some bush or small evergreen. Later, in the hillside woods, we find the yellow Lady's Slipper (*C. pubescens*), and in the swamps the largest and most elegant of all the group, the purple and white Lady's Slipper (*C. spectabile*). Then in the woods we have the variegated Orchis and some of the green Orchids, and now and then the small Twayblade and some other simple forms. On the borders of moist places and fields we have different species of purple and white Platantheras, while in the swamps the exquisite and rare Arethusa grows attended by Calopogons and Pogonias. These and others of varied and delicate hues and some with fine perfume number about forty different species.

Over seventy species of the Sedges (*Cyperaceæ*) may be collected along streams and ditches and in fields and meadows and even on mountain tops, and nearly eighty species of the Grasses (*Gramineæ*) are scattered over the state.

Of the Lily family (*Liliaceæ*) there are quite a number of species, most of them growing in moist ground.

In the flowerless or Cryptogamous plants Vermont is peculiarly rich. Along the mountain rivulet, bathed constantly in the spray of little cascades, in damp, cool woods, fringing the edges and festooning the faces of limestone cliffs, we have the feathery Ferns (*Filices*) and soft, green Mosses (*Musci*). About four-fifths of all the ferns belonging to the flora of the Northern United States may be found about Burlington. Although most of these delicate plants grow in moist, dark places, some prefer the open sunshine and the dry rock. The mosses are more independent of climate and station than the higher and more complicated vegetation. Most of the more delicate species grow where they can have plenty of moisture, but a great many love the dry and open fields, some flourish best on the bark of trees, others on the bare rock. In all sorts of places, in summer and winter, in sunshine or under snow, these little plants may be found living and growing. There are at least two or three hundred different kinds of mosses and closely allied plants in the state.

Of the higher flowering plants, over a thousand species have been collected within the limits of Vermont. Over fifty of these are large forest trees, and about fifty more are small trees or large shrubs. In such an article as this each group can be treated only in the briefest manner, and so can hardly be as interesting as if it could be more fully described.

GEOLOGY AND MINERALOGY
OF
ORLEANS COUNTY.

By Rev. S. R. HALL, LL. D., of Brownington, Vt.,
HONORARY MEMBER OF THE ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

This portion of Vermont contains a great variety of rocks which, though not of so great value commercially as those found in some other sections, are of equal scientific interest. Few, if any, of the rocks of Orleans County have failed of being metamorphosed. They are doubtless rocks of the Devonian and Silurian periods. Most of them are non-fossiliferous in their present state, but there is no reason to question, that fossils did once exist in some of them, perhaps most of them. Dr. Hitchcock says [Geol. Report, Vol. I, p. 33]: "We think we have Vermont granite and mica schist resting on fossiliferous limestone." In another place he says: "Just over the line of Vermont, near Jennings' Hotel upon the west bank of Memphremagog Lake, fossiliferous limestone is better developed than in Vermont, where also the only shells we have seen have been found. The same belt of limestone runs into Vermont and may be seen in Newport, Coventry, Irasburgh, Albany, Craftsbury and Wolcott." The latter town is in Lamoille County; the others in Orleans. The upper Helderberg limestone has clay slate on both sides of it, and coarse conglomerate near it." The rocks dip west, and this body of limestone is seen to plunge under the great range of talcose schist. Such strata, both in Canada and New England, usually dip east. On this account the position of the Memphremagog limestone is extremely interesting, for upon its age depends the age of the talcose schist."

The rocks in the western border of the county is Green Mountain gneiss, mica schist, talcose and chlorite schists, reaching easterly till they meet the range of limestone before described. There is in some parts of the Missisquoi Valley a narrow belt of clay schist and ranges of serpentine and steatite. The serpentine is largely developed on both sides of the Missisquoi River, in Westfield and Lowell, constituting quite a high hill, and seems to lie in a trough of steatite, the latter being generally found on both sides. A range or bed of granite which has been subjected to metamorphic influence, lying just west of the range of conglomerate rock, extends along the border of the talcose schist, also a stratum of novaculite reaching to the north-western part of Irasburgh. The range or bed of granite is very hard and seems as if it might have been nearly fused. It differs from any other granite found in the county if not in the state. The conglomerate seems to contain water worn pebbles and angular fragments of different rocks; and sometimes, as at Irasburgh, boulders of considerable size appear in clay schist. The conglomerate is seen by the side of the old road leading from the Coventry and Troy road toward Newport, some half a mile easterly, where both water worn and angular fragments are mixed together. The cut 269, vol. I. of Vt. Geological Report, page 449, exhibits the strata for some distance on both sides of the conglomerate. Some of the serpentine in the Missisquoi Valley, as at South Troy and Westfield, seems not, in some instances, to have been perfectly formed. At other places it is as perfect and beautiful as any beds found elsewhere in the state. Most of the steatite contains fragments of quartz, which injure its value so that it has not been quarried for useful purposes, at least, to any considerable extent.

The rocks in the central and eastern part of the county are upper Helderberg limestone, hornblende schist, sienite, granite and gneiss. In large sections, the first three are singularly interstratified, with frequent veins of quartz. In many places the strata change every few inches from lime to clay schist and hornblende. The limestone is predominant, and is often io filled with iron pyrites, that it is very rapidly losing its cohesiveness, and is converted into soil. This is equally true of some of the clay schists. Both the clay and hornblende schists contain several portions of lime and aid in forming new soil, as both in places rapidly disintegrate. It is doubtless this fact, as Dr. Hitchcock informs, that gives the soil of the county its excellent "agricultural capabilities. Those parts of the state, " the most fertile, are just the places, where lime is most abundant and decomposable." This is a treasure which Providence has hidden in the earth and provided for its elimination at the right time, and quantity, and it is of far more value, in my estimation, than all the other subterranean wealth of the state, yet I had no suspicion of its existence, till at a late stage of the survey, excepting on the west side of the Green Mountains." The reason for the last remark was, that he did not visit this county, till the latter part of the time he was in the field, when the writer called his attention to the rapid decomposition of limestone and clay schists of Caledonia and Orleans counties.

Within the calcareous and mica slate region, (so named by Prof. Adams,) there is an upheaval, or range of granite, of a very peculiar character. It is first seen on the east side of Lake Memphremagog in Stanstead, P. Q. and from thence may be traced through Derby, Salem, Brownington, Irasburgh, Albany and Craftsbury, and probably extends to Northfield in Washington County. In this range are some curious forms differing from most of the granite in the state. There is the tabular or jointed variety of granite of great beauty. All granite is jointed more or less, but the divisional planes are usually quite irregular, yet, in the variety under consideration, those planes are essentially parallel. The result is, that the mass is divided into tables often of large dimensions, but sometimes there are three sets of joints, and the blocks have a rhomboidal form. When the tables are thick, there is only one set of seams, and long columns can easily be got out." A magnificent development of these, may be seen at the south-west corner of Irasburgh where columns eighty feet long and three or four feet thick might easily be procured. "The tabular variety of granite is very common in the deposits of this rock, south of Lake Memphremagog in Coventry" and Brownington. The quantity in Irasburg would suffice to build a city, but has as yet, never been quarried. At some future period it will be regarded of immense value. It is within a mile of Black River.

Another variety of granite is called by Dr. Hitchcock, "concretionary." The basis of this remarkable variety, is rather fine grained, white and highly feldspathic. The mica however, is usually dark, and when it exists in large quantity it gives rocks the aspect of syenite, but there is no hornblende present. Scattered through this base, occur numerous spherical or elongated and somewhat flattened nodules of black mica from half an inch to two inches in diameter, and when elongated, the larger axis is sometimes seen as much as four or five inches long. They are usually flattened more or less, and have a shrivelled appearance like dried fruit. They sometimes become so thin as to consist of only a few plates of mica." A good representation of this is given in the Geol. Rep., Vol. II, p. 563. It is no wonder that the early settlers called these nodules "petrified butternuts."

When the writer first examined this curious variety, fifty years ago he gave it the name "nodular granite," and still prefers that name, notwithstanding Dr. Hitchcock has given the name "concretionary granite." He has sent specimens of it to Europe and various other places, and has received from various geologists acknowledgement accompanied by the remark, "your nodular granite is a great curiosity, We have never seen any thing like it." A German geologist, in his reply, said, "I have heard of something like it, in the north-eastern part of Germany." In the western part of Stanstead, is a small development of nodular granite, a few nodules are seen in Brownington in a ledge there, but it is seen in Craftsbury in a most magnificent development, and again in the western part of Northfield, where it is lost under the talcose schists.

The most beautiful forms of this singular rock, have been removed from the top of the mass in Craftsbury, by the Drift or some other agency, and moved southerly for a long distance. The specimens from which the cut in the Geol. Rep., p. 232, was made, the writer procured from a large boulder in the south-eastern part of Waterford. Another boulder nearly as beautiful lies in a stone wall in Lyndon, and another between Hazen Wood and East Hardwick Village. A boulder weighing fifty tons or more, of the same variety has been split for underpinning, at Ryegate. Another, larger, is still lying by the side of the road a mile, perhaps south of Judge Bells's in Walden. Talcose granite (Protogine) is found in this range at Craftsbury, which would, no doubt, make a valuable lining for furnaces. It occurs in several other places.

The granite in other parts of the county was, doubtless, formed at different times and is not of the same age.

Some of it is highly feldspathic, and in other places micaceous. The Adamsite, so named by Prof. Shepherd, was by Dr. Hitchcock, at first, thought to be gigantolite. It appears like black granite in places, but is a new mineral.

The granite, on each side of Willoughby Lake, differs materially. On the east side it is filled with veins or seams of great beauty, and which often cut each other. "In the veins, in one boulder, we can trace six periods and including the granite have itselt, seven periods of formation, or, as most would say, of injection". (See Geol. Rep. Vol, II, p. 571. Quite a cabinet may be easily collected of different varieties of the granite of the county, and no two similar. "It is, doubtless a metamorphic rock." It is, perhaps, not to be wondered at, that Dr. Hitchcock says, "the rocks of Vermont are the most difficult, with which I have ever attempted to grapple."

Besides the stratified rocks and granite, there are several trap dykes of considerable interest, which differ from others found in the state. This is found in Brownington, half a mile north of the Congregational Church near Dea. Buxton's. It may be called calcareous, feldspathic trap. In parts of it, there are imperfectly formed pentagonal folds or concretions. An immense dyke is found in Albany, near the Lowell road, on land of Mr. Hayden. Several are found in Craftsbury, one of these is near the house of Mr. Person, half a mile south of the Common. This is very interesting. It may be traced a great distance. Several others are on land formerly occupied by Mr. Wm. Scott.

Talcose and chlorite schists, serpentine aud soapstone, with a narrow range of clay-schist and novaculite, constitute most of the rocks in the western parts of the county; silicious limestone, clay and hornblende schists, the central portion; and granite, syenite and gneiss, the eastern part.

Gold is found in several towns, in the talcose slate region, but only in limited quantities, Gold hunting will never be profitable. Silver has been found only in connection with galena, and in minute portions. Copper, in very small quantities, has been found in one or two places. But from the fact, that it is found in strata in Canada, which extend into the county, and also in Wolcott, south west of it, we may perhaps expect to find it here, when more thorough examination has been made. Lead occurs only in Newport, and there in small quantities only. The titaniferous iron ore of Troy, and the chromic iron ore of Jay, Troy and Westfield, are the only ones of iron, of value. Troy ore bed is of great value, but so difficult to smelt, that it is not now worked. The furnace built many years ago, has become the property of a non-resident, who is not disposed to manufacture iron, nor to sell the property to others at the present worth. While the ore is really of the most valuable kind, it is hardly probable, the county will derive much benefit from it.

The chrome ore of Jay has changed owners several times, but has never been wrought to any considerable extent. The quality of the ore is good. No examination has been made to acertain the quantity. The ore lies in the serpentine rock, and may exist in either large or small quantity. The larger vein of this one, on Mr. Miller's farm in Westfield has not been opened to any extent. Its value is at present unknown. The variety usually occurs in wedge shaped masses, and not in continuous veins. Its value can be estimated only by extensive mining.

Emerald nickel has been discovered at South Troy, but of its amount or value the writer is ignorant. Nickel has been discovered at Westmore. Its amount or value is equally unknown.

No minerals of great value have been discovered. Ahead of emery, existing at Westmore is now being used with Turkish emery in the manufacture of emery wheels, at West Charleston. Of the extensive beds of asbestos found in Lowell, large quantities have been shipped, it is said, for the manufacture of incombustible paper. It is now believed that it will prove of great value. Much of the serpentine of that, and other towns is very beautiful, and will doubtless, at some future time be highly valued. No other minerals or metals of commercial importance, have been discovered, except the novaculite. The ledge of this stone, at Newport, formerly worked for hones, gave great satisfaction. It, no doubt, is valuable. Another ledge in Irasburg is, doubtless, of equal if not of greater value, but has never been worked.

CATALOGUE

OF

CRYPTOGAMOUS OR FLOWERLESS PLANTS

OF VERMONT.

By CHAS. C. FROST, Brattleboro, Vt.

The enumeration of these plants, is not intended to be a complete Catalogue of Vermont Cryptogamia, but merely of such as I have observed in my visits to various parts of the state during the last fifteen years. I am not aware that anything of this kind has yet been published in the State; and I submit this, therefore, as the beginning of a more complete Catalogue which I am in hopes may be extended by other botanists. It is a work which I think would amply repay them for their labors, since there are probably few States that present, in proportion to their areas, a greater number of richer varieties of this series of plants. I possess well authenticated specimens of all mentioned, except a few which were destroyed in a late catastrophe.

EQUISETACEÆ. HORSETAILS.

Equisetum arvense, L.
Moist fields &c.

E. sylvaticum, L.
Moist woods and shady places.

E. limosum, L.
In shallow waters.

E. hyemale, L.
Wet banks.

E. variegatum, Schleicher.
Shores or river banks. Burlington and Bellows Falls.

E. scirpoides, Michx.
Moist woods and banks.

FILICES. FERNS.

Polypodium vulgare, L. *(Polypod.)*
On rocks &c. in woods.

Adiantum pedatum, L. *(Maidenhair.)*
Moist woods.

Pteris aquilina, L. *(Brake.)*
Thickets, dry fields and woods.

Pellaea gracilis, Hook. *(Cliff brake.)*
On rocks overhanging the "Devil's den," Burlington.

P. atropurpurea, Link.
Limestone cliffs, Burlington, and on Willoughby Mt.

Woodwardia Virginicum, Smith.
Wet swamps.

Asplenium Trichomanes, L. *(Spleenwort.)*
Steep rocky ledges.

A. ebeneum, Ait.
Rocky open woods.

A. Ruta-muraria, L.
Limestone cliffs near "High Bridge," Burlington.

A. angustifolium, Michx.
Wet places in woods.

A. Thelypteroides, Michx.
Rich woods.

A. Filix-foemina, Bernh.
Moist woods.

Camptosorus rhizophyllus, Link. *(Walking leaf.)*
Shaded calcareous rocks, Burlington.

Phegopteris ploypodioides, Fee.
Damp woods and shady banks.

P. hexagonoptera, Fee.
Open woods.

P. Dryopteris, Fee.
Rocky woods.

Aspidium Thelypteris, Swartz. *(Shield fern.)*
Marshes.

A. Noveboracense, Swartz.
Moist woods.

A. spinulosum, Swartz.
vars. **intermedium, dilatatum** and **Bootii.**
Woods and swamps.

A. cristatum, Swartz.
var. **Clintonianum.**
Swamps &c.

A. Goldianum, Hook.
Rich woods.

A. marginale, Swartz.
Rocky hillsides in woods.

A. acrostichoides, Swartz.
var. **incisium.**
Rocky woods &c.

A. aculeatum.
var. **Braunii,** Koch.
Woods about the "Notch" at the base of Mansfield Mt, Plymouth.

Cystopteris bulbifera, Bernh. *(Bladder fern.)*
Shaded ravines.

C. fragilis, Bernh.
Shaded rocks.

Struthiopteris Germanica, Willd. *(Ostrich fern.)*
Low grounds.

Onoclea sensibilis, L. *(Sensitive fern.)*
Moist or wet places.

Woodsia obtusa, Torr.
Rocky banks, &c.

W. Ilvensis, R. Brown.
On exposed rocks.

W. glabella, R. Brown.
Rocks, Willoughby Mt.

Dicksonia punctilobula, Kunze.
Moist and shady places.

Osmunda regalis, L.
Swamps and wet woods.

O. Claytoniana, L.
Low grounds.

O. cinnamomea, L.
Swamps, &c.

Botrychium ternatum, Eaton. *(Moonwort.)*
vars. **Lunaroides, obliquum,** and **dissectum.**
Dry rich woods.

B. Virginicum, Swartz.
Rich woods.

Ophioglossum vulgatum, L. *(Adder tongue.)*
Bogs and meadows.

DUST STORM IN VERMONT.

FEB. 12, 1870.

BY, HIRAM A. CUTTING, A. M., M. D.

Read before The Dartmouth Microscopic Club, Oct. 26, 1870.

The evening of Feb. 11,1870, closed in cloudy with a breeze from the north east, barometer falling, and everything appearing to indicate a storm. It was unusually cold for cloudy weather yet the clouds seemed dark and heavy. At about eleven the wind was fairly in the east and blew strongly during the night. About five o'clock on the morning of the 12th, it commenced snowing and the wind immediately changed to the south and in a short time to the south west, the snow still falling. When it became light the snow seemed brown, and upon examination was found to contain dust or ashes giving it the peculiar brown color. It continued in this way until about eight o'clock during which time about three inches fell; when the snow ceased, the wind changed to the west and the clouds became broken with squalls of clear snow until 6 P. M. when the wind was north-west, the sky cloudless and the cold rapidly increasing. At 10 P. M. the thermometer was at 14°, the same as it was at that time the day before. The highest temperature reached was about 10 A. M. when it was really thawing with the thermometer at 37°.

I am fully aware that dust storms in many sections are of common occurrance, but not so in this vicinity. They are frequently the result of burning forests as there is then carried up in the smoke a large amount of dust from the consuming vegetation, and I am aware that in the United States at least nine-tenths of all dust storms are attributable to this cause. In all instances however where examination has been made such dust would reveal under the microscope the existance of vegetable ashes and minute woody fibre. I am informed by Prof. S. F. Baird, Assistant Secretary of the Smithsonian Institution that repeatedly samples of such dust from snow have been sent to them and in almost every instance the microscope would show in it the result of burning forests or vegetation.

During the summer of 1868 when immense fires were raging in the forests of Washington Territory the whole Pacific coast was clouded in smoke and such dust storms as before referred to were frequent over a large extent of territory. In these showers the microscope invariably showed vegetable fibre and left no doubt of their origin. Near large tracts of arid desert, like Sahara in Africa, dust storms are frequent, and of course are the fine particles of sand taken up by the wind and the finer portions are frequently borne to great distances. Such showers are frequently observed on the west coast of Africa sometimes falling on the decks of ships many miles off the coast. A late shower in the south of France, which was very extensive, the microscope shows was from this cause. Dust showers of volcanic ashes are also frequently met with in volcanic countries, even hundreds of miles from volcanoes. Such a shower occurred at Guayaquil in July, 1869, which was referred to the volcano of Pichunha, which rises immediately above the plain of Quito. Other dust showers are meteoric, frequently depositing a fine dark brown or black dust in considerable quantities as in Canada, July 4, 1814, and at Montreal, Nov. 14, 1819.

Red dust has also been deposited in like manner in sufficient quantities for analysis, and is found like the dark colored to contain a similar composition to meteoric stones. Again there are sometimes microscopic animalcules, or microscopic plants, but few of these are however on record. Under some circumstances we have a combination of materials as they frequently do in Prussia. In that country on bright June days there suddenly arises from the western horizon a dark gray offensive cloud which gradually increases until it covers the whole sky and changes the warm air into a cold stormy, and leaden atmosphere depositing a dust upon everything; which is found upon microscopic examination to be composed of vegetable remains charred, and minute particles of sand. The cause is that the marsh lands of Hanover and the adjacent flat countries are burned every summer in order to obtain a scanty crop of buckwheat, from the almost barren soil. The windy gusts caused by so much fire take up particles of sand which, with the particles of vegetable matter carried up with the smoke and wind, cause the showers refered to.

As a general thing all such phenomena can be traced to their first cause, but in the shower of dust with snow first spoken of as falling in Vermont, we are at once left in obscurity. For a thousand miles in either direction the ground was covered with snow. It was in fine, midwinter and no fires were raging on the continent, or at least I can get no trace of any. It is thousands of miles from any volcano and as we might judge brought by the wind from the Atlantic as the clouds came from that direction. No open dust plains are accessible, and yet the dust falls to the weight of three grains to the square foot, in Concord, Lunenburgh and Guildhall in Essex County, Craftsbury and Brownington of Orleans, and in Kirby and Burke in Caledonia Counties. In all, over quite an extensive tract of territory.

By analysis it contains some silex, is slghtly alkaline containing traces of sulphur, spores of various atmospheric fungi and a variety of ingredients which the minute quantity prevented the determination of, and as the amount on hand was so small I could gain but an approximate idea of the proportion of ingredients named. The dust is very fine showing no trace of vegetable origin neither does it compare with any volcanic dust I could obtain. Upon comparison with meteoric dust from Europe I find a great resemblance though there are some forms in this I do not find in that. What analysis I am able to make proves nothing. If it was meteoric we might expect to find traces of iron which I could not find, yet it might contain it, if not magnetic. In analysis of dust which came from a burning pine forest, according to "Booth" there was found a large per cent of silex, much larger than is common in ashes, and an alkaline or acid might be obtained from the atmosphere as well as in rainwater. Meteoric dust as far as known always contains silex and of course dust from sandy locations would be almost certain to do so. Volcanic ashes would contain it also. We will sum up our conclusions as follows :—

It is not sand dust from a beach or desert or other terrestrial tract, as the corners do not show any action of water but are rounded apparently by heat, and many points of fracture are sharp and angular. It is not from a burning forest as there are no traces of vegetable fibre. It does not seem to be volcanic, as it does not possess the highly vitreous appearance of the fine dust thrown from volcanoes, yet it seems to have been subject to great heat as the fused corners of some of the particles attest.

It is probably meteoric as it seems more nearly to agree in shape and appearance with dust known to be such, although close microscopic examination shows a slight difference from my meteoric samples. If meteoric as it appears to be, we can of course only trace its origin in fields of conjecture and wonder that such an amount of matter could come in contact with our atmosphere without causing more disturbance.

The amount which fell upon the territory where I have traced the fall of it by the testimony of the inhabitants, must amount to over ninteen thousand tons of matter, yet it came so silently as to hardly excite surprise, and though hundreds noticed it, no one but myself saved any of it for future examination, and *I* only a limited quantity.

[In the "Popular Science Review," for Jan. 1871, an account of a snow storm in Switzerland is given, in which the snow was colored by dust, which, after chemical and microscopical examintion, was pronounced by eminent scientific men to be "meteoric," thus supporting the views of the writer.—*Eds.*]

◆

INSECT FAUNA OF CAMEL'S HUMP.

By PHILIP S. SPRAGUE, Boston, Mass.

I am induced to prepare this list of insects, the result of a two days Entomological tour on Camel's Hump, Aug. 11 and 12, 1869, to encourage and assist others of Vermont in cultivating a taste for this most fascinating science. You who have the time and inclination will find this subject a continual feast of pleasure, the ground has been but little trodden and you have an open field before you.

Mountainous regions are especially attractive to all lovers of nature. There the Entomologist finds a fauna peculiar to the locality.

Order,—COLEOPTERA. *(Beetles.)*

Fam.—CICINDELIDÆ.

Cicindela sexguttata, *Fab.*

CARABIDÆ.

*Notiophilus semistriatus, *Say.*
Dyschirius globulosus, *Putz.*
*Calathus impunctatus, *Lec.*
Platynus sinuatus, *Lec.*
Pterostichus adoxus, *Lec.*
caudicalis, *Lec.*
flebilis, *Lec.*
*punctatissimus, *Rand.*
*honestus, *Lec.*
Amara arenaria, *Lec.*
*Bradycellus cognatus, *Schiodte.*
Harpalus viridiaeneus, *Beauv.*
compar, *Lec.*
pensylvanicus, *Lec.*
herbivagus, *Say.*
*Patrobus tenuis, *Lec.*
*Trechus micans, *Lec.*
Bembidium picipes, *Kirby.*
quadrimaculatum, *Gyll.*
wingatei, *Bland.*
Tachys nanus, *Schaum.*

BRATHINIDÆ.

*Brathinus nitidus, *Lec.*

BYRRHIDÆ.

Cytilus varius, *Er.*

ELATERIDÆ.

Cryptohypnus abbreviatus. *Lec.*
*Elater luctuosus, *Lec.*
*Eanus maculipennis, *Lec.*
*Sericosomus incongruus, *Lec.*

LAMPYRIDÆ.

Calopteron typicum, *Lec.*
reticulatum, *Fac.*
Lucidota atra, *Lac.*

---

* Species found near the summit and of the sub-alpine fauna.

Photinus nigricans, *Lac.*
Telephorus scitulus, *Lec.*
fraxini, *Lec.*

TENEBRIONIDÆ.

Upis ceramboides, *Fab.*
Iphthimus opacus, *Lec.*
Nyctobates pennsylvanica, *Lec.*
Paratenetus punctatus, *Spin.*

ANTHICIDÆ.

Notoxus ancora, *Hentz.*

MELANDRYIDÆ.

Dircaea concolor, *Lec.*

MORDELLIDÆ.

Anaspis rufa, *Say.*
Mordella scutellaris, *Fab.*
Mordellistena scapularis, *Say.*

CEPHALOIDÆ.

Cephaloon lepturides, *Newm.*

CERAMBYCIDÆ.

*Eurypterus sanguinicollis, *Horn.*
Tetrapium cinnamopterum, *Kirby.*

CHRYSOMELIDÆ.

*Galeruca sagittariae, *Kirby.*
Disonycha,—two species.
Haltica exapta, *Say.*
Luperus meraca, *Say.*

COCCINELLIDÆ.

*Coccinella tridens, *Kiaby.*
Hyperaspis elegans, *Muls.*
bigeminata, *Lec.*

BOSTRICHIDÆ.

Hylesinus opaculus, *Lac.*

Order,—LEPIDOPTERA.

Fam.—RHOPALOCERA.

Pieris rapæ, *Sehrank.*
Colias philodice, *God.*
Chrysophanus americanus, *D'Urun.*
*Limenitis arthemis, *Boisd. and Lec.*

*Argynnis atlantis, *Edw.*
*Grapta comma, *Doubl.*
faunus, *Edw.*
Hesperia wamsutta, *Harr.*

HETEROCERA.

Trochilium tipuliforme. *Linn.*
Baptria albovittata, *Guen.*
*Melanippe gothicata, *Guen.*

Micro-Lepidoptera,—ten species.

Order,—ORTHOPTERA

Five species, undetermined.

Order,—HEMIPTERA.

Thirty species, undetermined.

Order,—HYMENOPTERA. †

Allantus basillaris, *Say.*
Hylotoma McLeayi, *Leach.*
Tiphia inornata, *Say.*
Urocerus albicornis, *Fabr.*
Ichneumon caeruleus, *Cress.*
comes. *Cress.*
Halictus, Pompilus, Bracon, Trogus, Ichneumon, sp.

Order,—NEUROPTERA.

Panorpa rufescens, *Rambur.*

Order,—DIPTERA. ‡

Bittacomorpha clavipes, *Fabr.*
Spilomyia fusca, *Loew.*
Lucilia cæsar. *Linn.* ?
Beris, Pangonia, Oncodes, Laphria, Thereva, Sericomyia, Echinomyia, sp.—Spilomyia, n. sp.

---

†Named by Dr. Packard, Salem, Mass. ‡ Named by Mr. Edw. Burgess, Boston, Mass.

SCIENTIFIC INTELLIGENCE AND EDITORIAL.

Meeting of the Dartmouth Microscopic Club.—This Club held its semi-annual meeting at Hanover, Oct. 26 and 27.

President E. E. Phelps, M. D., LL.D., in the chair.

Prof. L. B. Hall, of Hanover, N. H., read a paper upon "the Point of Growth in Exogenous Stems," showing many sections of stems illustrating and proving the following points, viz.: 1st. The young extremity of a branch matures from below upwards, the pith, wood, and bark, all parts alike. 2nd. In the older stem the medullary rays grow from the pith outwards. 3d. The forms of these rays are not due to accidental portions left between the woody bundles, but each kind of tissue has its own form and place in the stem. 4th. These forms and positions are under the control of the vital forces. Any explanation of the positions and shapes of the parts as a result of mechanical forces only, is far from the truth.

Dr. H. A. Cutting, of Lunenburgh, Vt., read a paper on a dust storm which recently occured in Northern Vermont; it was fully illustrated by microscopic specimens.

Vermont State Geologist.—Hiram A. Cutting, A, M., M. D., of Lunenburgh, has recently been appointed State Geologist, and Curator of the State Cabinet. From private correspondence we learn that he is intending "to label and rearrange the specimens in the State Cabinet; put up and complete the collections of Vermont birds; bring the entomological department as near as possible to represent the different species of Vermont insects; try to complete the specimens of Vermont mollusca; obtain as many new specimens of minerals as possible, and put them in order; finally, to make our State Cabinet desirable and profitable for those interested in science."

Our Journal.—Our subscribers will notice that the present number is only one half the size that was promised in the prospectus of 1870, and somewhat behind time. The cause we shall charge to our printer, for we had our copy ready early in December, and besides we had abundant subscription to publish it. We shall issue the April number, of the same size as this one, and but a little behind time. Our subscribers may rest assured that they will get the full number of pages promised by us. We would further state that our subscription list is steadily increasing, and we have every prospect of seeing the Archives of Science on a living basis.

BIBLIOGRAPHICAL NOTICES.

A Treatise On Ore Deposits. By Bernhard Von Cotta. Professor of Geology in the Royal School of Mines, Freiberg, Saxony. Translated by Frederick Prime. Jr. Mining Engineer. Published by D. Van Nostrand, 23 Murray and 27 Warren streets, N. Y. pp. 574.

This work is divided into two parts: General and Special. The first or General part gives an introduction into the principles of Ore Deposits, occupying 94 pages. The second or Special part, occupying the remainder of the work, treats of the most important Ore Deposits of Europe without any particular reference to their geographical distribution. The following order of description is observed: 1 Germany, commencing with the Erzgebirge; 2 The Carpathian Countries; Gellicia, Transylvania, Hungary, Banat, and Servia; 3 The Alps in their entire extent; 4 Italy; 5 France; 6 Spain; 7 Great Britain; 8 Scandinavia; 9 European Russia.

Under each locality a description of the minerals present, are given, showing all the peculiarities of the manner of their occurance. with many deposits, the geological formations surounding them are also given, and in many instances, illustrations of the strata and deposits are added.

An index of places is given at the end of the work, which facilitates reference to localities; also an index of some technical or unusual words, expressions and definitions is given.

First Annual Report on the Noxious, Beneficial, and Other Insects of the State of Missouri. By C. V. Riley, State Entomologist. 1869. 2 Plates. 98 Wood-Cuts. pp. 181.

Second Annual Report on the Noxious, Beneficial, and Other Insects of the State of Missouri, By C. V. Riley, State Entomologist. 1870. 99 Wood cuts. pp. 135.

These Reports are replete with information useful to agriculturists, and important to practical entomologists. We wish our own State would awake to a realizing sense of this most useful department of agriculture, and appoint a state entomologist drawing sufficient pay to enable him to thoroughly gather together a knowledge of our insects and put it into a readable shape for distribution among those who desire to avail themselves of such knowledge.

Record of American Entomology for the Year, 1868. 8vo. pp. 52.
Record of American Entomology for the Year, 1869. 8vo. pp. 62.
Edited by A. S. Packard, Jr., M. D. Published by the Naturalist Book Agency, Salem, Mass.

This is a yearly index to all papers published on the Insects of America, showing at a glance the progress made in each order, for the years, 1868-9. It is a work that should be encouraged by every working entomologist, whose labors will be greatly facilitated by its use. It is gotten up on the same plan as the Record of Zoological Literature by Albert C. L. G. Gunther, but is devoted exclusively to American Entomology. 335 New species of North, and Central American Insects have been described in the various scientific publications during the the past two years.

Geology and Physical Geography of Brazil. By Ch. Fred. Hart, Professor of Geology in Cornell University. pp. 620. Published by Fields, Osgood & Co. Boston, Mass.

This book is the result of two journeys in Brazil by the Author himself, one was made under the direction of Professor Agassiz, with the Thayer Expedition in 1865-6, the other the following year. We could not expect in a work of this size, from an exploration of less than three years, covering a territory of more than twenty degrees latitude and something more than that longitude, in its greatest depth, to receive a detailed account of all the geological formations, nor minute descriptions of the surface of the country, but the general features are acurately given in a clear, concise manner, The journal of their first journey was given in a former work, leaving this entirely free from the monotony which usually exists in relating daily occurances in Travels.

The work is divided into ninteen Chapters, taking up the subjects in the following order: Province of Rio de Janeiro; Espirito Santo; Minas Geraes; The Islands and Coral Reefs of the Abrolhos; Bahia; The Sao Francisco Basin; Sergipe and Alagoas; Pernambuco; Parahyba do Norte; Rio Grande do Norte; Ceara; Pitnhy; Maranhao; Para and Amazonas; Goyaz and Matto Grasso; Sao Paulo, Parana Santa Catharina, and Rio Grande do Sul; The Gold Mines of Brazil; Lastly we get some accounts of the Botocudos, one of the leading tribes of Indians.

Thirteenth Annual Report of the Board of Commissioners of the Central Park. With plates, maps and photographs, pp. 185.

Central Park is the pride and play-ground for the old and young of

New York City. Yet recreation and amusement do not constitute the entire object of this magnificient place; several public spirited gentlemen from the City have organized themselve as "American Museum of Natural History," and procured a charter from the Legislature. They have raised about $40,000, and purchased 12770 specimens of Natural History from various sources, which is to serve as a nucleus for a future collection. Prof. B. Waterhouse Hawkins has been engaged in modeling and restoring to their natural size and appearance, several extinct animals belonging to the Secondary Geological {Epoch, consisting of the gigantic *Hadrosauras*, thirty-nine feet in length; also several of the Post-Tertiary Period, viz: *Mastodon*, *Mammoth*, *Megatherium*, *Megalonyx*, *Glyptodon*, *&c.*

A Zological Garden is in progress and is constantly receiving valuable additions from numerous sources.

The Legislature of the State of New York have authorized the Board of Commissioners "to erect, establish, conduct, and maintain on the Central Park a Meteorological and Astronomical Observatory, and a Museum of Natural History and a Gallery of Art, and the buildings therefor, and to provide the necessary instruments, furniture, and equipments for the same."

The Meteorological Department has been in full operation for the past year, and the apparatus used are all self-registering and probably is the most accurate and complete set on this Continent. It is under the charge of Daniel Draper, and it is to his ingenuity and skill that this Observatory has been put into such perfectness. The barometer and the dry and wet bulb thermometers are registered by means of a photographic apparatus, every variation is accurately indicated, also the time when such variations occured. The fall of rain and snow is registered by an ingenious contrivance, not only giving the amount but the exact time of beginning and ending of each shower. The direction, velocity and force of the wind are indicated for every second of time during the whole twenty-four hours.

Phosphate Rocks of South Carolina, their History and Development. With five Colored Illustrations, by Francis S. Holmes, A. M., late Professor of Geology and Paleontology in the College of Charleston. Published by Holmes' Book House, Charleston, S. C. pp. 87.

Prof. Holmes gives a description of the various strata of rocks of the "Great Carolina Marl Bed," their origin and formation, also some accounts of their fossiliferous deposits, including the history of the discovery of stone arrow heads, a stone hatchet, and human bones in the Post-Pleiocene Age. Several analyses of various vegetable products of Marls and Phosphate Rocks are introduced showing the great value of these deposits as fertelizers.

Hand-Book of Mineral Analysis, by Frederich Wöhler, Professor of Chemistry in the University of Göttingen. Edited by Henry B. Nason, Professor of Chemistry in the Rensselaer Polytechnic Insittute, Troy, New York. Published by Henry Carey Baird, 406, Walnut Street, Philadelphia, Pa. pp. 315.

This work was not intended to be an elaborate treatise on the Analysis of Minerals, but as its name indicates, a Hand-Book, for the use of those engaged in the laboratory, for which purpose it will be found very useful. Under the heading of each mineral are given one or more concise processes for isolating its ingredients from its ores or compounds. Over 130 different mineral substances are thus treated. Appended to the work, are Tables of Equivalent Weights of Simple and Compound Bodies, which will be very convenient for the working analyst.

First Medical and Surgical Report of the Boston City Hospital. 1870. Published by Little, Brown & Co. Boston, Mass.

This volume of 688 octavo pages, gives a report of the numerous cases treated at the Boston City Hospital for the first five years of its existence. The great variety of cases reported make this eminently useful to the physician, and a valuable addition to American medical literature. We would be glad to speak of the merits of this work at a great length, but in a journal of the character of ours it would not be appropriate; however we commend it to our medical brethren in country practice as a work of reference. It is edited by the Medical and Surgical Staff of the Hospital. It is printed in large, clear type, on nice, thick paper, and is illustrated with plain and colored lithographs, photographs, and wood cuts.

Physician's Visiting List for 1871. Published by Lindsay and Blackiston, 25 S. Sixth St. Philadelphia. For 50 patients,—$1,50.

Physicians know the value of these diaries and need no explanations from us.

The Alleged Malpractice Suit, Margaret Sarah Walsh vs. Lewis A. Sayre. pp. 190. Published by Geo. H. Shaw & Co. 176 Fulton St. New York.

This is a valuable and interesting report for lawyers and doctors. Every person about to commence a suit for damages against a surgeon would do well to read this book.

Gynæcological Record. Prepared by Joseph G, Pinkham. A. M., M. D. Published by James Campbell. 18 Tremont St. Boston, Mass. Quarto. pp. 196. $2,50.

Physicians will find this an excellent book in which to record their important female cases. It is so arranged that by filling out blanks in each case a good description and history will be had up to the present time, then a detailed account of it for the next six months or more will require only one page, and not more than one hour's time. Two diagrams are also given, on which any tumour or malposition of organs &c., may be traced by a few strokes of the pen. There are other blanks which may be used for any purpose desired.

TRANSACTIONS

OF THE

ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

ORGANIZATION.

The following notice appeared in "The Newport Express," for Sept. 7, 1869:

A special meeting of the Orleans County Natural and Civil Historical Society will take place at the New Academy Hall, in Derby Sept. 13, at 2 o'clock P. M. All interested in the objects of this society are invited to be present.

(Signed) S. R. Hall, President.

The following individuals met in the Academy Sept. 13, 1869, in persuance to the above notice:

Rev. S. R. Hall, LL. D.,	Brownington.
J. E. Dickerman, Esq.,	Derby.
J. L. Edwards, Esq.,	"
L. Richmond, M. D.,	Derby Line.
Geo. West.	North Derby.
Samuel Sumner, Esq.,	Troy.
J. M. Currier, M. D.,	Newport.
M. H. Fuller, A. B.,	"
Rev. A. A. Smith,	Lowell.
Rev. Daniel Goodhue,	Westfield.

Rev. Dr. Hall took the chair.

Dr. J. M. Currier was elected Secretary *pro tempore.*

The Constitution and By-Laws of the Society were read by the President. Remarks were offered in relation to having new Constitution and By-Laws. The following named persons were unanimously elected a committee to present a new code at a future meeting which should be called by them whenever they should be prepared to report, by giving notice in "The Newport Express," J. M. Currier, A. A. Smith, M. H. Fuller, H. A. Spencer, L. Richmond and D. M, Camp, 2d.

The following notice appeared in "The Newport Express," for Sept. 21, 1869 :

All persons in Orleans County who are interested in the progress of the Natural Sciences, are requested to meet at the Academy Hall in Derby, on Tuesday, Sept 28, 1869, at 2 o'clock P. M. for the purpose of organizing such a society.

(Signed) J. M. CURRIER, Chair. Com.

Several persons interested in the Natural Sciences assembled agreeable to the foregoing notice, which was read by J. M. Currier.

Dr. L. Richmond was elected Chairman, and Dr. Currier, Secretary *pro tempore*.

The Committee reported a Constitution and By-Laws, which were unanimously adopted. The following persons subscribed the obligation:—

Rev. H. A. Spencer,	Derby.
J. E. Dickerman, Esq.,	"
Geo. Henry Bliss,	"
L. Richmond, M. D.,	Derby Line.
J. M. Currier, M. D.,	Newport.
D. M. Camp, 2nd,	"
Royal Cummings,	"
M. H. Fuller, A. B.,	"
Geo. A. Hinman, M. D.,	West Charleston.
E. P. Colton, Esq.,	Irasburgh.

The following officers were elected to hold office until the next annual meeting, viz :

Geo. A. Hinman, M. D.,	President.
Rev. H. A. Spencer,	First Vice President.
E. P. Colton, Esq.,	Second Vice Pesident.
J. M. Currier, M. D.,	Secretary.
M. H. Fuller, A. B.,	Treasurer.
Geo. Henry Bliss,	Auditor.

The President upon his election took the chair.

Voted to suspend further organization until the next meeting.

Rev. S. R. Hall, LL. D., of Brownington was unanimously elected honorary member.

Voted that the Secretary be instructed to purchase a Seal and necessary blanks for the society.

Voted to adjourn to Oct. 26, at 2 o'clock P. M.

ARCHIVES OF SCIENCE.

VOL. I. APRIL, 1871. NO. III.

Observations on the Beaver of Orleans County. By Hon. Isaac Parker, A. B., East Coventry, Vt.

Whether any animals, except the human species, possess the faculty of reasoning, or are guided and directed in all their actions by certain invariable instincts specially adapted to support and maintain their existence, is a question long discussed, but hitherto not definitely settled by the wise.

In many acts of different animals it is difficult to say they do not compare facts and ideas and deduce conclusions in the manner, which we call reasoning. The beaver has always been distinguished as among the foremost of these, which seem to possess this high order of intellect. He begins life by searching out a place for a permanent residence. He is a great traveller and never idle, and how many waters he surveys in his search for a home is not known, but he is generally found on a stream not larger than a medium sized mill stream and often much smaller, and always located on the best spot for his purposes, on the whole length of it. This fact, which is admitted by all who are familiar with his habits, tends to prove that he had searched the whole stream, compared all the different places, and selected, like a good engineer, the very best. His great object in all this, is to find a plentiful young growth of such timber as he wishes to live upon, situated where he can raise the water near to it by a dam that will not be very expensive.

I have always thought that in choosing his place of residence, in locating and deciding the hight of his dam, the beaver exhibits a high degree of intellect, which, if styled instinct, makes it difficult to find the dividing point between that principle and sound judgement or reason. Having chosen his spot for the dam, he begins by cutting the wood and brush which are to form a part of it. I examined one in process of construction, where the alders were all cut on half an acre or more, and a share of them woven and twisted together, and laid in the line of the dam, in appearance like a large windrow of hay. I think the alder, not being used for food, is used almost exclusively for building purposes. On the same stream below, there was an establishment where eight beavers were taken; and in closing up my business with them it became necessary to draw off the pond in order to find one of them. The dam was a little more than five feet high, formed like the roof of a building and so compact, and well filled in with earth, that no freshet could move it, and no water pass through it. In making drain through it I found plenty of work for a short November day. No stick could be pulled out till cut in two places, when the part between could be removed. The house is built of the same material, and situated a little back from the deep water on a bog or head-land with a canal reaching to the pond, so deep that the ice will not obstruct it.

In laying up his winter's stock of provision, he cuts black ash, white maple, birch, willow, and poplar trees from two to four inches in diameter, in such lengths as he can handle and lays a tier on the bottom of his pond near the dam with one end against the current fastened in the mud. while the other rises a little above the bottom. Then other tiers are lapped on like shingles on a building till his supply is laid up. When the small growth is short he cuts trees from eight to fourteen inches in diameter, and leaves them on the land, where, in case of need before Spring, he gets through the ice and makes his meals of the bark on the branches. I once saw a beaver at work on an elm tree some twenty inches in diameter, standing on the bank of the stream nearly a mile from his home. The tree had apparently been knawed occasionally for several years, and was about half cut through. What the object could be I was at a loss to imagine, unless it should be to maintain his character for industry, being always at work "like a beaver."

The beaver is a thick set, heavy animal, moderate and clumsy in his motions on land, but quite active in the water, and travels several miles in a night, always by water. He has been represented as very cautious and shy. This is not true until he has been educated by being once in the irons and using his own incisors on his own foot or leg. He then seems to look about for the cause of his calamity, and recollecting there was a man about his residence when the trouble came, he correctly charges it upon him, and comes to the general conclusion that all men are villains and always to be shunned. Ever after this if a man comes near his premises he leaves home and friends before the next morning. One case in proof of this, among several within my knowledge, happened in Upper Canada. Two men, who supposed they understood the habits of the beaver, found the works of one, and prepared to take him. But after a week's trial, they found he was missing. They pursued and found him on different streams the third time, with like success. Before they found him the fourth time, he had run in the way of another man, who by examining the wood he had cut, noticed it appeared like wood cut with a dull axe, and inferred from that fact that he had been in a tight place and dulled his teeth upon the iron which held him. Being thus informed of his true character, a sort of blockade was prepared at some distance from his home, and he was soon taken in attempting to retreat. About the time his pelt was taken off his former persecutors came up, and found the beaver had but one sound foot; and that he had learnt more of their character in the school of adversity, than they had ever known of his.

When the Indians owned the country they considered the beaver as property, and managed them somewhat as we do our cattle. Whenever they left them they were sure to find them at any future day; and when they wished to kill any, they selected the old ones and left the young ones to multiply and raise another family. The usual way of making the selection was to prepare a back load of stakes, and creep cautiously to the canal between the house and pond, and make a strong fence across it, then draw off the water from the pond, drive them out of their house, and they have them in a deep ditch between the house and their fence. and could kill such as they pleased with a lance like a bayonet or by a rap with a tomahawk.

When the white settlers crowded upon them, the Indians knowing that their right of property in wild animals would not be respected, made a general raid upon the beaver and other animals of value to them. In this general slaughter, a few escaped which in many cases began to increase and doubtless would have remained among us to this day. had they been as wisely treated by the whites as they had been by the Indians. There is no doubt that all New England was originally densely inhabited by beavers, and that they were very plenty in Vermont, as the remains of their works may yet be seen on almost every small stream.

The last visit the Indians made the beaver in this part of our state, and probably in any part, was in the Spring of 1809, when a party of them came up lake Memphremagog and encamped on Indian Point; leaving their families, the men went directly to the eastern part of Brownington, where was a pretty large community of beavers on a branch of Willoughby's River. and in two days they killed and scattered the whole. A Mr. Jeremiah Morrill of Irasburg, the principal hunter of the county, had found them in the winter before, and thinking he could take them better in open water than under the ice left till spring. To his sorrow he found that delays were dangerous and that the Indians were just two days ahead of him. In this raid of the Indians Orleans and Essex counties were fully searched and here and there a solitary beaver was left.

When the Indians wish to sweep the whole they generally cut a sluice in the dam, and lie in wait for the owner when he comes to mend it. Tradition has handed down a story of a white man who being on good terms with the Indians, went with them to take some beavers on a branch of Moose River in the town of Victory. The establishment was large, and after making an opening in the dam they placed themselves tomahawk in hand, and waited for the game. In the course of the night they killed fifty two.

The few left by the Indians, scattered about Northern Vermont, and pursued by a new race of hunters, were, in a few years, all destroyed. The last one, I think, was taken on Clyde River in Derby by Mr. Charles Sias about 1830. Thus, wherever civilization extends itself, this interesting animal becomes extinct.

It is pleasant to converse with Nature in the deep wilderness, where everything, animate and inanimate bears the impress of the hand that made it, unmarred by the hand of man. It is a place where the pure air, much more invigorating, than that we breathe in our close houses, will restore declining health better than all the nostrums which doctors deal in; and where the mind, wearied and worn by the cares and confusion of civilized life, enjoys a rest and independence not to be found elsewhere, and a constant feast on beauties which never become insipid, and never cloy.

Catalogue of, and Observations on the Birds of Vermont.

By Rev. Daniel Goodhue, Westfield, Vt.

[Rev. Daniel Goodhue has kindly consented to furnish these observations on the Birds of this State, which will appear in the Archives of Science, from time to time as materials come to hand. When finished, this will be a complete catalogue of Vermont Birds. We would ask all persons who take an interest in Ornithology and are in possession of any facts relating to this delightful branch of Natural Science, to communicate with the author, in order to assist him in making accurate and full reports. Mr. Goodhue has taken great interest in the study of Birds and their usefulness to the agriculturist.—*Eds.*]

HALIAETUS LEUCOCEPHALUS, Savigny.

White Headed or Bald Eagle.

This rare and beautiful bird is occasionally seen in Vermont. It comes to us as an intruder and robber praying upon other birds, and taking from the fish hawk its hard earned livlihood. It is a bird foreign to us, as it has never been known to propogate in this state.

AQUILA CANADENSIS, Cassin.

The Golden, or Ring-tailed Eagle.

This bird may be called a native of this state; it has been known to lay its eggs and rear its young within our borders. It differs from the White Headed Eagle in its choice of location for its nest; the latter choosing the top of a very high tree, while the Golden prefers some inaccessible place upon the precipice of a high mountain, usually a sort or prominence over one of the lakes.

STRIX PRATINCOLA, Bonap.
The Screech, or Barn Owl.

This bird is very common in Vermont, and is often, by its screeching noise, a terror, not only to boys, but to men, especially to those who are not accustomed to hearing them, should they happen near where they are perching in the night. The little boy said "it made my hair stand right up." It seems impossible that so small bird can make such a terrific noise! It sounds as though it was that of some terrible wild beast. And this all the *harm* it does.

TROGLODYTES AEDON, Vieill.
The House Wren.

This bird is common in Vermont, as in other states. One of its peculiarities is in building its nest; its exterior is made of sticks of enormous size, compared with the size of the bird. By this means it secures a strong fortification against the intrusion of other birds, such as the Blue Bird and Martin. This bird has been known to take possession of a house built for the above named birds, and so faught that it has defended itself and kept away intruders as they approached and commenced removing its fortifications. After it has won a victory it will sing its song most sweetly. It is very useful in destroying insects to feed its young, which number from five to eight.

TURDUS MIGRATORIUS, Linn.
The American Robin.

This favorite bird is known to follow the plough apparently as tame as the hen, plucking insects and worms as they are exposed. It not only builds its nests in trees and shrubs near dwellings but on the beams and braces of sheds, and under the eav es of houses. They have been seen by Dr. Currier, in the coldest weather in midwinter, in the very northern parts of the state, feeding on the berries of the Mountain Ash.

PICUS AURATUS, Linn.
Golden-winged Woodpecker.

This is one of the most useful birds in this section of country. By some people it is called "the Large Brown Woodcock," but it is not the bird known in the Southern States by this name, and no doubt that it truly belongs to the family of woodpeckers. It is quite a favorite bird with the hop-growers. It watches the hop-yards for what is called the hop-worm, which is almost sure to destroy the vines unless some means are used to prevent. Said Mr. Ray Davis, an extensive hop-raiser, of Troy, Vt., "This bird is a very early riser; as soon as any daylight appears it visits the hop-yard and examines each hill, listens and looks carefully, and if it suspects a worm it digs, at times, several inches into the hill, and as soon as it reaches the worm it spears it and carries it away to its young; and so it keeps at work protecting our hop-yards."

Its bill is long, hard, and wedge-shaped; its tongue is long and round, and may be extended three or four inches beyond the end of its bill. The end is of a horny substance, with teeth on each side like the barbs of a fish-hook. Its bill answers for a chisel to cut holes in trees in search for insects; as soon as it has opened a space upon one, large enough to receive it, it is pierced with its tongue. We have an account of one that chiseled to "the center of a branch of a young, tough, white oak tree, from three to five inches in circumference, and there found that destructive insect, the *borer*. They are often heard pecking upon old dead trees, in pursuit of the larvæ of insects that usually exist between the bark and wood of trees. Many think they do much damage to their apple-trees, hence, kill all they can, but instead of injuring the trees they are a noble protector against the borer.

SPIZELLA SOCIALIS, Bonap.
The House or Chipping Sparrow.

This is a real domestic bird. I once knew a family of them fed so regularly from the table that they were as tame as the domestic chickens. Sometimes they would pick crumbs out of the hands of a little child, and would allow the child to carry them about the room in its hands without being alarmed. I once sat at the window of my study, and saw the little sparrow (more industrious than myself), watching my potato-vines, and clearing them from insects, for its own food and that of its young. It often builds its nest in shrubs and bushes cultivated near our dwellings. It is known by the name, *Hair-Bird*, from lining its nest with hair. It often builds by the side of the robin on the same bush.

Natural History Papers. By Hiram A. Cutting, A. M., M. D. Lunenburgh, Vt.

Order,—APHANIPTERA. (*Dana.*)
APTERA. (*Lemark.*)
SUCTORIA. (*Degeer.*)

Family,—PULICIDÆ.

PULEX IRRITANS.—To this order of wingless insects, belong the *flea* and *louse;* they are natives of all countries. In this article I shall speak only of the single family of Pulicidæ, of which the common flea (*Pulex irritans*) is the leading type. The body of this insect is of an oval form, somewhat flattened, covered with a hard skin, of a brilliant chestnut brown color, more or less covered with bristles, arranged in rows. Its mouth is suctorial and is composed of a complete apparatus both for inflicting wounds and for sucking blood into its stomach.

The Pulicidæ are all small insects, yet their anatomy is well known. The mouth is composed of seven pieces, having inside the beak, which is a jointed sheath, a tube, and carrying underneath two long sharp lancets with cutting and sawlike edges which pierce the skin causing the blood to flow, which is voraciously swallowed. It has two round bright eyes situated upon the sides of the head, and antennæ placed behind them, which are continually shaken when the animal is in motion, but when he is at rest are sometimes closed into a cavity by a lid or scale. Its body is divided into thirteen segments, three of which belong to the thorax, one to the head, and nine to the abdomen, which is large. Its rudimentary wings are represented by small scales. The legs are long and muscular, the tarsus has five joints and terminates in hooks turned in opposite directions. The jumps which these animals make are really gigantic and their strength herculean. To give some idea of their strength, I will mention some well attested facts concerning them. Geoffroy in his "Histoire abreree des Insectes" relates that a certain Englishman had succeeded, by dint of patience and art, in making a gold chain the length of a finger, with a padlock and key to fasten it, not exceeding a single grain in weight. A flea attached to the chain pulled it easily. Another person constructed a carriage and six horses of ivory. The coachman was on the box with a dog between his legs, there was also a postillion, four persons in the carriage, and two servants behind, and the whole of this was drawn by one flea.

Barron Walkener in his work on Natural History says, that while in Paris in 1825 he went to see the learned fleas which all could see by paying a small admittance fee. He says he examined them through a magnifying glass with entomological eyes, and saw some thirty fleas go through military exercises, standing upon their hind legs, armed with picks, formed from very small splinters of wood. "Two fleas were also harnessed to, and drew a golden carriage with four wheels, and a postillion. A third flea was seated on the coach box, and held a splinter of wood for a whip. Two other fleas drew a miniature cannon on its carriage. These and other wonders were performed on polished glass. The flea horses were attached by a gold chain fastened to the thighs of their hind legs, which I was told was never taken off. They had lived thus for two years and a half, not one having died during this period. To be fed they were placed upon a man's arm which they sucked. When they were unwilling to go through the required performances the man moved a burning coal near when they at once recommenced their labors."

But let us return to the natural history of our insect. The female lays from ten to fifteen eggs which are of an oval shape, smooth and white. She does not fasten them to anything but lets them drop wherever she happens to be. If a dog is infested with fleas many of their eggs may be found where he lays. There may, upon close inspection, be found with these eggs little particles of brilliant black color which is dried blood, that the careful mother has supplied for the food of her offspring. In from four to eleven days according to the warmth of the weather, may be seen coming out of these eggs small larvæ covered with hair, and divided into three parts, the last provided with two small hooks. The head is scaly, having two antennæ, but I am unable to find any eyes even with a high magnifying power. They are without limbs yet can twist themselves about and advance quite rapidly. They are at first white but afterwards become reddish. About two weeks of this life and they are apparently about to die, but in reality weave themselves a cocoon from which they emerge in another fortnight perfect insects.

One remarkable trait is that the flea seems to know her own progeny in the larval state and frequently feeds them by discharging blood with which she is filled, yet I do not think this feeding necessary for their existence as many are never fed. The flea seems to have a choice among the animals it selects for its prey. The pig and dog seem to enjoy the preference, yet most animals are infested more or less and there seems to be a little variation of the order in different animals, but not sufficient to require mention here.

PULEX PENETRANS.—There is however the chigre or jigger(*Pulex penetrans*) of the West Indies, which departs considerable from the varieties above mentioned. It is much smaller, flat, brown, with a white spot upon its back, and armed with a beak provided with three lancets. With these the female makes an incision into which she creeps, lodging in the skin and bringing forth her young there. This makes a painful sore and the insect has to be extracted.

The chigres are an object of terror to the natives of warm countries which they infest, as they sometimes attack a limb in such numbers as to bring on mortification, and even death. Many of the Brazilian Negroes are permanently disabled from this cause. The larvæ do not live either in the body of the parent or of its host, but are pushed out, falling upon the ground where their transformations are like those of *Pulex irritans*, whose progeny they then resemble.

Family,—PEDICULIDÆ.

PEDICULUS CAPITIS.—Though the Louse is common to almost all animals, a description of this species answer to a great extent for all. This insect has a flat body, slightly transparent, and spotted with black, soft in the middle but rather hard at the sides. The head which is oval is furnished with two thread-like antennæ composed of five joints which are constantly in motion when they are walking; it is also furnished with a pair of jet black eyes, and with one of the most peculiar mouths that insects have. When at rest its mouth seems to form a little protuberance on the front of its head. This protuberance contains a sucker which is forced out at will. When extended it is a tube terminating in six little pointed hooks curving backwards thus serving to return it in the skin of its victim. At the end of this sucker and in its interior are four fine hairs joined together in a peculiar manner apparently calculated to aid in the process of extracting the blood from the scalp, but in what manner they act is not known. The thorax is nearly square and divided into three parts by deep incisions. The abdomen is composed of eight rings or bands extending round the insect. They have six legs, all terminating in a peculiar strong nail that folds back into an indented projection, thus forming a pincer by which the louse fastens itself to the hair, clinging with great tenacity.

In their reproduction they are oviparous. Their eggs which remain sticking to the hair are long and white, commonly called "nits." The young, hatched in five or six days, and in about sixteen or eighteen days are able to reproduce their kind. Yet their fecundity is so great that it is calculated that under favorable circumstances, this species is capable of producing in forty days at least one hundred and twenty-five thousand from a single pair. Happily for the victims of this disgusting parasite their reproduction is not usually to any such extent.

Another species, the Pediculus humanus corporis, exceeds the Pediculus capitis in reproductive powers, many hundred times, but happily for the human family it is not as common. This species causes a fungous growth or disease of the skin called *pityriasis*, and though not common at the present day, like the leprosy, was a terror to the ancients, and with reason. They not only infested the poor, but the rich and learned were susceptible, and history informs us of numerous instances of death from this disease. King Antiochus, it is stated, was so covered with lice before his death that his skin was a crumling mass of them, and baskets-full were scraped off and burned. The philosopher Pherecydes, the dictator Scylla, Agrippa, Unlerius Maximus, and many other noted men died in a similar manner. It is also recorded in authentic history that some families of distinction through many generations were always attacked just before death with these parasites; and were always certain that when lice came upon them that their end was near. An authentic case is related in Portugal, of a nobleman that was attacked with lice in such a manner that it required two servants continually to carry away and throw into the sea the vermin that escaped from the head of their royal master. I am aware that some of those cases seem more like fiction than fact, or would if the testimony of eminent physicians of our time did not substantiate them.

Wilson a celebrated English physician in 1865, says: "I have sometimes in malignant fevers found the bodies of my patients teeming with lice, even when the powers of life were scarcely sufficient to preserve the body from decomposition. They would many times come on in a few hours so as to completely cover the skin, even on persons of cleanly habits." I am inclined to believe that certain stagnant conditions of the fluids of the body are favorable for their reproduction. We have the testimony also of Sir Benjamin Brodie, that once when opening a tumor he found it not full of pus as he expected, but full of lice.

But man is not alone afflicted with parasites, almost every beast. bird, or fish has its peculiar species; and as we come down to microscopic vision even these lice themselves have *their* parasites and through this entire range there are variation and points of peculiar interest, but it would require a book to trace their histories.

(*Continued.*)

Catalogue of Cryptogamous or Flowerless Plants of Vermont. By Chas. C. Frost, Brattleboro, Vt.

(Continued from page 81.)

LYCOPODIACEÆ.—Club Mosses.

Lycopodium lucidulum, Mich.
Cool and damp woods.

L. Selago, L.
Summit of Mansfield and Camel's Hump Mountains.

L. annotinum, L.
Woods.

L. dendroideum, Mich.
Moist woods.

L. clavatum, L.
Dry woods.

L. complanatum, L.
Woods.

Selaginella rupestris, Spring.
Dry exposed rocks.

S. apus, Spring.
Moist low grounds.

ISOETES.—Quillworts.

Isoetes echinospora, Durieu.
Ponds, Mansfield Mountain.

I. riparia, Englm.
Margins of ponds or dull streams.

I. Englemanni, Braun.
Shallow ponds or ditches.

MUSCI.—Mosses.

Sphagnum cymbifolium, Dill.
Bogs and spamps.

S. Lescurii, Sulliv.
Shores of ponds.

S. squamosum, Pers.
Bogs and swamps.

S. acutifolium, Ehrh.
Bogs and swamps.

S. cuspidatum, Ehrh.
Bogs and swamps.

Andraeæ rupestris, Turner.
On rocks, Mansfield Mountain.

Bruchia flexuosa, Schwaegr.
Damp grounds.

Gymnostomum curvirostrum, Hedw.
Rocks.

G. rupestris, Schwaegr.
On wet rocks.

Weissa viridula, Brid.
Old fields, hill-sides.

Campylopus viridis, Sulliv. &. Lesqx.
Decaying logs, Mansfield Mountain.

Didymon fragilis, Hook.

Trematodon longicollis, Rich.
Clayey and sandy soil.

Dicranum pellucidum, Hedw.
On rocks near streams, Brattleboro.

D. varium, Hedw.
Clayey banks.

D. heteromallum, Hedw.
Moist ground.

D. flagellare, Hedw.
Decaying logs in woods.

D. scoparium, L.
On earth and decaying logs in woods.

D. undulatum, Turner.
On earth in dry woods.

Ceratodon purpureum, Bridel.
On earth &c.

Leucobryum glaucum, Hampe.
Roots of trees and swampy ground.

L. minus, Hampe.
On earth in dry woods.

Fissidens minutulus, Sulliv.
Damp rocks in shaded ravines.

F. bryoides, Hedw.
Shady rocks.

Fissidens adiantoides, Hedw.
Moist places and wet rocks.

Conomitrium Julianum, Mont.
Shallow streams.

Trichostomum tortile, Schrd.
Clay banks, roadsides.

T. vaginans, Sulliv.
Road sides and ditches.

T. pallidum, Hedw.
Clayey grounds.

T. glaucescens, Hedw.
Dry hill sides.

Barbula unguiculata, Hedw.
Clayey soil.

B. caespitosa, Schwaegr.
Woods about roots of trees.

B. convoluta, Hedw.
Woods and moist banks.

B. mucronifolia. Br. & Sch.
Rocky banks of streams.

B. fallax, var. brevifolia, Muhl.
Rocks near streams.

Pottia Truncata, Br. & Sch.
On earth, &c.

Tetraphis pellucida, Hedw.
On earth in woods.

Encalypta ciliata, Hedw.
Rocks in woods.

Drummondia clavellata, Hook.
Bark of trees.

Orthotrichum strangulatum, Beauv.
On trees

O. Ludwigii, Schwaegr.
On trees.

O. Hutchinsiæ, Smith.
On trees.

O. crispum, Hedw.
Rocks.

Schistidium apocarpum, Br. & Sch.
Rocks.

Grimmia Olneyii, Sulliv.
On rocks near streams.

G. Pennsylvanica, Schwaegr.
On rocks and stones.

Grimmia Donniana, Smith.
On walls.

Racomitrium aciculare, Brid.
Mountain streams.

R. fasciculare, Brid.
Moist rocks.

R. ellipticum, Br. & Sch.
Moist rocks.

Hedwigia ciliata, Ehrh.
Rocks and boulders.

Buxbaumia aphylla, Haller.
Around stumps in woods.

Diphysium foliosum, Web. & Mohr.
Clayey or barren soil.

Atrichum undulatum, Beauv.
Moist clay banks.

A. angustatum, Beauv.
Shady woods and swamps.

A. crispum, James.
Banks of streams.

Pogonatum brevicaule, Brid.
Moist clayey banks.

P. urnigerum, Brid.
Mountains.

Polytrichum commune, L.
Shady moist places.

P. formosum, Hedw.
Base of trees in woods.

P. Juniperinum, Hedw.
Margin of woods.

P. Juniperinum, var. strictum.
Mansfield Mountain.

P. piliferum, Schreb.
Rocky places.

Aulacomnium heterostichum, Br. & Sch.
Woods and shady banks.

A. palustre, Schwaegr.
Swamps.

Bryum pyriforme, Hedw.
On ground in burnt woods.

B. crudum, Schreb.
Moist banks.

B. nutans, Schreb.
Moist shady soil.

Bryum roseum, Schreb.
Base of trees in woods.

B. Wahlenbergii, Schwaegr.
Springy places.

B. argenteum, L.
Roofs, walks, pavements, &c.

B. pseudo-triquetrum, Schwaegr.
Wet rocks.

B. bimum, Schreb.
Wet earth on rocks.

B. capillare, Hedw.
Moist banks in woods.

B. caespiticium, L.
Rocks, grounds, and in dry places.

Mnium affine, Bland.
Damp ground, shady places.

M. hornum, Hedw.
Mountains.

M. stellare, Hedw.
Hills in woods.

M. cinclidioides, Hedw.
On stones in mountain streams.

M. punctatum, Hedw.
Wet places.

M. rostratum, Schwaegr.
Woodland rivulets.

M. cuspidatum, Hedw.
Base of trees in woods.

Bartramia Oederi, Swartz.
Mountains.

B. pomiformis, Hedw.
Shady banks.

B. fontana, Brid.
Springy places.

Funaria hygrometrica, Hedw.
Ground and walls.

Physcomitrium pyriforme, Br. & Sch.
On the ground &c.

Fontinalis antipyretica, var. gigantea, Sulliv.
Rivulets.

F. biformis, Sulliv.
Rivulets.

F. Novæ-Angliæ Sulliv.
Rivulets.

Fontinalis Etonii, Sulliv.
Rivulets.

F. disticha, Hook. &. Wils.
Rivulets.

F. Lescurii, Sulliv.
Mountain rivulets.

F. Frostii, Sulliv.
Rivulets.

F. Dalecarlica, Bryol. Europ.
Rivulets.

Dichelyma falcatum, Myrin.
Mountain rivulets.

D. capillare, Bryol., Europ.
Rivulets.

Leucodon julaceus, Sulliv.
Trees.

Leptodon trichomitrium, Mohr.
Woods, on trees.

Anomodon viticulosus, Hook. & Tayl.
Shaded rocks.

A. attenuatus, Hub.
Rocks and roots of trees.

A. tristis, Cesati.
Trees.

Leskea obscura, Hedw.
Trees within reach of floods.

L. rostrata, Hedw.
Base of trees in woods.

Thelia hirtella, Hedw. (Sulliv.)
Roots and trunks of trees.

T. asprella, (Schimp). Sulliv.
Roots and trunks of trees.

Myurella Careyana, Sulliv.
Springy ground on hills.

Anacamptodon splanchnoides, Brid.
Hollow knots on trees.

Pylaisaea intricata, Bryol. Europ.
Trees and logs.

Homalothecium subcapillatum, Bryol. Europ.
Trees.

Platygyrium repens Bryol. Europ.
Old fences and logs.

Pterigynandrum filiforme, Hedw.
Rocks and trunks of trees.

Cylindrothecium cladorrhizans, Bryol. Europ.
Old logs &c.

C. seductrix, Bryol., Europ.
Old logs and roots of trees.

Neckera pennata, Hedw.
Trunks of trees.

Climacium Americanum, Brid.
On earth in moist places.

Hypnum tamariscinum, Hedw.
On the ground and logs.

H. delicatulum, L.
On the ground in dry places.

H. minutulum, Hedw.
Decaying logs in woods.

H. scitum, Beauv.
Base of trees.

H. gracile, Br. & Sch.
Decaying logs.

H. abietinum, L.
Mountain swamps.

SCIENTIFIC INTELLIGENCE AND EDITORIAL.

Observations on the Rocks of Westfield, by Rev. T. Mackie.—The Rocks of Westfield, are principally talcose slate running parallel with an extensive band of serpentine in connection with steatite commonly known as soapstone, which, when pure, is valuable for the purpose of making stoves and lining furnaces. Mica slate is also present as well as chloritic slate. The latter is mixed up with quartz and specular iron. There is scarcely a stream in Westfield that does not contain gold in small quantities but not sufficient to pay for extraction. Mining for gold would be more likely to pay where it exists in the quartz veins running through talcose slate.

The serpentine is the rock in which we may expect to find asbestos and chrome ore; the first named may be manufactured into lamp wicks and fire-proof paper, which would be valuable for all important records; and the latter when found in sufficient quantity would pay well for mining. Serpentine is also found in close proximity to good roofing slate, and in my opinion a band of it will yet be found to the east of the serpentine.

Taken altogether the rocks are of a very interesting character and may prove at some future day rich in the useful minerals.

Phenomena occuring in Oct. 1870. *Reported by J. M. Currier, M. D.*—An unusually brilliant display of the aurora borealis occured in the evening of Oct. 14, 1870, commencing at about half past six o'clock and continuing till ten P. M. It commenced with a bright red streamer in the northwest shooting upwards towards zenith, which soon faded and was followed by numerous patches of white and red streamers reaching zenith, covering the northern half of the firmament. About 8 o'clock the whole firmament, excepting a small portion near the southern horizon was covered with white streamers intermixed with bright red and yellow ones, all vividly shooting upward and centering a few degrees south of zenith. At one time the whole southern half of the heavens was covered with these streamers while there was only one small patch of red ones in the northern.

At four minutes past 8 o'clock it was so light that the time could be noted by the watch. This was the most brilliant and beautiful display that has ever been witnessed in this country.

On the morning of the 18th. at half past six o'clock commenced a fine rain from the south, which lasted till about ten A. M. when the wind changed to the northwest, and blew in violent gales the remainder of the day and following night. Snow and hail succeeded the rain, which ended about five P. M. The mercury sank to 14°

Fah. from seven till two P. M. In this county many trees and buildings were blown down, and other damages done.

At thirty minutes past eleven o'clock on the morning of the 20th. a heavy shock of an earthquake was felt at this place, its duration was nearly thirty seconds. There was one continuous shaking, attended by a low rumbling sound similar to that produced by the passage of a heavy wagon over frozen ground, a fact observed by several of our citizens and quite uniformly described by them, more particularly by those who were walking along the street. Door bells were rang, crockery thrown from shelves and broken, rocking chairs set in motion, tables tipped, houses rocked and creaked, doors opened, chimneys were thrown down, and various other demonstrations of its power were manifested. Several persons standing on the deck of the "Lady of the Lake," (an iron steamer which plies the waters of Lake Memphremagog), felt the shock severely and were frightened. The waters near the shore were noticed to be roiled. The day was rainy and when the shock occured it was raining very heavily without the least breath of wind.

We learn that this shock was felt along the Atlantic Coast and far into the interior of the United States.

BIBLIOGRAPHICAL NOTICES.

The Molluscan Fauna of New Haven. A critical review of all the Marine, Fresh Water and Land Mollusca of the region, with descriptions of many of the living animals and of two new species. By George H. Perkins, Ph. D., Professor of Zoology, Botany and Geology, in the University of Vermont. [From the Proceedings of the Boston Society of Natural History, Vol. XIII, 1869.]

The Molluscan Fauna of the Later Tertiary of Peru. By E. Thomson Nelson, Ph. D., Professor of Natural History in Hanover College, Hanover, Indiana. [From the Transactions of the Connecticut Academy of Arts and Sciences. Vol. II, Part 1.]

The species described in this paper are mostly new to science. and are illustrated by two plates.

Annual of Scientific Discovery: or, Year-Book of Facts in Science and Art, for 1871, exhibiting the most important discoveries and improvements in Mechanics, Useful Arts, Natural Philosophy, Chemistry, Astronomy, Geology, Biology, Botany, Mineralogy, Meteorology, Geography, Antiquities, etc., together with notes on the progress of science during the year 1870; a list of recent scientific publications; obituaries of eminent scientific men, etc. Edited by John Trobridge, S. B., Assistant Professor of Physics in Harvard College; aided by W. R. Nichols, Asst. Professor of Chemistry in Mass. Inst. of Tech.; and C. R. Cross, graduate of the Institute. Published by Gould and Lincoln, Boston.

This annual contains the usual amount of important matter. The advantage of these annual abstracts are two fold: 1st. a great amount of useful information is brought together from an extensive field of research and observation; 2nd. the very neat bound volume which it forms, is within the means of the most humble.

Fifty-third Annual Report of the Trustees of the New York State Library.

The School Laboratory of Physical Science. Edited by Gustavus Hinrich, Professor of Physical Science in the State University of Iowa.

The objects of this journal are to introduce and encourage the study of the sciences in American schools, and to elevate the standard of science teaching in them. We most heartily concur with the editor's views and wish his enterprise success.

Diseases of the Womb. Uterine Catarrh frequently the Cause of Sterility. New Treatment. By H. E. Gantillon, M. D. pp. 51. Published by James Campbell, Boston.

TRANSACTIONS

OF THE

ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

OCTOBER 26, 1869.

Adjourned Meeting at Derby.

President HINMAN in the chair.

Acting Members.—The following persons were nominated for acting members, and were elected, viz:

Geo. S. Kelsea, M. D.,	Newport.
Alfred Randall, Esq.,	"
L. H. Bisbee, Esq.,	"
W. D. Crane, Esq.,	"
J. C. Rutherford, M. D.,	"
S. W. Dane, Esq.,	"
J. Grout, Jr., Esq.,	"
Hon. J. L. Edwards,	Derby.
Hon. E. A. Stewart,	"
H. Fairchilds,	"
Rev. J. G. Lorimer,	"
H. D. Holmes,	Derby Line.
J. F. Wright,	Coventry.
D. W. Blanchard, M. D.,	"
Rev. T. E. Ranney,	West Charleston.
Rev. Daniel Goodhue,	Westfield.

Honorary Members.—Hon. David M. Camp of Derby was elected an honorary member.

Donations to Museum.—9 specimens of fossiliferous limestone from Newport, Vt.; 110, illustrating the common rocks of the county, 4, undetermined species of fungi, 4, of coleoptera, 1, of hemiptera, *from J. M. Currier;* 1, of petrified moss from a calcareous spring in Derby, *from J. Y. Green;* 32, of minerals from various places, *from A. Randall;* 1, of native copper from Lake Superior, *from C. G. Goodrich.*

Donations to Library.—32 volumes of public documents, *from D. M. Camp, 2nd.;* 7 volumes of public documents, *from W. D. Crane;* package of pamphlets and journals, *from J. M. Currier.*

Committees.—The following committees were announced by the president and duly elected, viz:

Ethnology.	T. E. Ranney. H. Fairchilds. J. C. Rutherford.
Comp. Anat. and Gen. Zool.,	D. W. Blanchard. G. S. Kelsea. J. F. Wright.
Mammalogy.	L. Richmond. A. Randall. W. D. Crane.
Ornithology,	D. Goodhue. S. W. Dane. J. E. Dickerman.
Herpetology and Icthyology,	J. Grout, Jr. D. M. Camp, 2nd. R. Cummings.
Invertebrata,	G. H. Bliss. H. D. Holmes. E. A. Stewart.
Entomology,	E. A. Stewart. M. H. Fuller. J. G. Lorimer.
Botany,	J. M. Currier. H. A. Spencer. T. E. Ranney.
Paleontology,	J. L. Edwards. A. Randall. E. P. Colton,

Geology and Mineralogy,	E. P. Colton. D. W. Blanchard. D. Goodhue.
Library,	G. A. Hinman. H. A. Spencer. M. H. Fuller.
Publications,	J. L. Edwards. J. G. Lorimer. J. M. Currier.

Curators.—M. H. Fuller and E. A. Stewart were elected curators.

Librarian.—M. H. Fuller was elected librarian.

Purchases.—Voted to instruct the secretary to purchase several works on the different departments of natural science such as would facilitate the naming and study of the different species, also to procure a sufficient number of insect pins.

NOVEMBER 9, 1869.

Regular Meeting at Derby.

President HINMAN in the chair.

Donations to Museum.—One pair of deer's horns from Southern New York, *from N. C. Cole, of Newport, Vt.;* slab of Italian marble, and fruit of the walnut, *from H. Fairchilds;* one beetle, *from M. L. Smith, of Newport;* two minerals from Newport, *from J. M. Currier.*

Acting Members.—The following persons were elected acting members, viz:

J. A. Bowker, M. D.,	West Charleston.
C. I. Vail, Esq.,	Irasburgh.
Rev. A. A. Smith,	Lowell.

Associate Members.—N. Cheney, M. D., of Beebe Plain, P. Q., was elected associate member.

Publishing Prospectus.—Voted to have 400 prospectuses of the society printed and circulated among similar societies and academies.

Articles for Cabinet.—Voted that the secretary be requested to purchase sufficient material to commence work on a microscopical cabinet.

JANUARY 11, 1870.

Regular Meeting at Irasburgh.

President HINMAN in the chair.

Acting Members.—The following persons were nominated for acting members, and were elected, viz:

Rev. E. P. Wild,	North Craftsbury.
Rev. A. W. Wild,	Greensboro.
Rev. S. K. B. Perkins,	Glover.
Rev. J. C. Houghton,	Coventry.
N. M. Darling,	West Albany.
A. G. Bugbee, M. D.,	Derby Line.
F. W. Harding, M. D.,	Derby.
C. L. Erwin, M. D.,	Newport Centre.
Rev. J. Thurston,	Barton Landing.
J. M. Winslow, M. D.,	Brownington.
W. B. Moody, M. D.,	"
Rev. W. A. Robinson,	Barton.
Hon. J. P. Sartle,	"
J. F. Skinner, M. D.,	"
A. A. Earle, Esq.,	"
L. S. Thompson,	Irasburgh.
L. W. Adgate, M. D.,	"
Hon. I. N. Cushman,	"

Report.—E. P. Colton made a report of the manganese ores of the county. The society requested him to prepare a written report for publication in their Transactions.

MAY 10, 1870.

Regular Meeting at Derby.

President HINMAN in the chair.

Communication.—Rev. T. E. Ranney read a communication presented by Wm. W. Grout, on the aboriginal history of northern Vermont.

Donations to Cabinet.—*From H. A. Spencer*, concretionary granite from Groton, Vt., and beautiful crystals of maple sugar; *from A. A. Smith*, asbestos and willow galls from Lowell, Vt.; *from J. M. Currier*, talc from Potton, P. Q., garnets from Derby, 1 fungus from Salem, 1 diptera, 5 coleoptera, and 1 crustacean from Newport, calcite, adamsite, and lichens from Salem, burs of two species of pine from Derby.

Acting Members.—Wm. W. Grout, of Barton, was elected an acting member.

Corresponding Members.—Hiram A. Cutting, A. M., of Lunenburgh, Vt., was elected corresponding member.

Publishing Transactions.—Voted to have the Transactons of the society published in the Archives of Science.

Communication.—Rev. T. E. Ranney read a communication on the Pawnee Indians.

Donations to Library.—Public documents *from Hon. J. S. Morril.*

JULY 12, 1870.

Regular Meeting at Newport.

President HINMAN in the chair.

Resignation of Treasurer.—The Treasurer made a report of the financial condition of the society, and presented his resignation, being about to leave the county.

Communications.—Rev. T. E. Ranney read a communication on the character and habits of some of the North American Indians.

H. H. Cutting read a communication on the microscope, and exhibited several beautiful specimens in anatomy and natural science.

Donations to Cabinet.—33 entomological specimens *from J. M. Currier;* several microscopical specimens *from H. A. Cutting.*

Treasurer.—At a meeting of the Council immediately after the exercises D. M. Camp, 2nd. was elected Treasurer.

SEPTEMBER 13, 1870.

Annual Meeting at Derby.

President HINMAN in the chair.

Officers.—The following officers were elected for the ensuing year, viz:

G. A. Hinman,	President.
H. A. Spencer,	First Vice President.
E. P. Colton,	Second Vice President.
J. M. Currier,	Secretary.
D. M. Camp, 2nd.,	Treasurer.
G. H. Bliss,	Auditor.

Committees.—The following committees were announced by the president and duly elected, viz:

Comp. Anat. and Gen. Zool.,	D. W. Blanchard. G. S. Kelsea. J. F. Wright.
Ethnology,	T. E. Ranney. H. Fairchilds. J. C. Rutherford.

Mammalogy,	G. A. Hinman. A. Randall. W. D. Crane.
Ornithology,	D. Goodhue. F. W. Harding. J. E. Dickerman.
Herpetology and Icthyology,	J. Grout, Jr. D. M. Camp, 2nd. R. Cummings.
Invertebrata,	G. H. Bliss. H. D. Holmes. E. A. Stewart.
Entomology,	J. M. Currier. E. A. Stewart. J. G. Lorimer.
Botany,	J. M. Currier. H. A. Spencer. T. E. Ranney.
Paleontology,	J. L. Edwards. A. Randall. E. P. Colton.
Geology and Mineralogy,	E. P. Colton. D. W. Blanchard. D. Goodhue.
Library,	G. A. Hinman. H. A. Spencer. E. A. Stewart.
Publications,	J. M. Currier. R. Cummings. J. L. Edwards.

Curator and Librarian.—E. A. Stewart was elected Curator and Librarian.

Report on Botany.—The committee on botany reported that they had in preparation the revision of a catalogue of the plants, not only of Orleans County but of the entire State, cryptogamic as well as phenogamic. Several able botanists in the state having been already engaged in the work.

Exonoration.—Voted to exonorate A. A. Earle and

D. M. Camp from paying the admission fees and the annual dues, in consideration for printing notices of the meetings without charge to the society.

Donations to Cabinet.—Several specimens of hornblende in calciferous mica schist from Derby, *from W. Fuller*; several varieties of hornblende from Newport and Coventry, *from J. M. Currier.*

ARCHIVES OF SCIENCE.

Vol. I. JULY, 1871. No. IV.

Birds, in their Relation to Agriculture. By Geo. H. Perkins, Ph. D., Professor of Zoölogy, Botany and Geology, in the University of Vermont. Read before the Vermont State Board of Agriculture, June 1871.

That all may have as complete an understanding of the subject as may be let us say a few words in regard to the zoölogical characters and position of birds, not so much for the sake of bringing forward anything new, as to revive in the memory facts already known. Birds may be scientifically characterized as air-breathing, warm-blooded, oviparous vertebrates, fitted for aerial life. Probably no group, of equal rank, in the animal kingdom presents so great uniformity in its essential characters. Among all the hundreds of differing tribes of the feathered race we find no such strange and aberrant forms as we have among the mammals in the winged Bats or the finned Whales. It is true that all birds do not fly, but they do all possess wings of some sort, though they may use them only as fins, as do the Penguins, or as aids in running, as do the Ostriches.

Intense activity characterizes all the functions of the body as well as great efficiency. Nowhere else do we find so complete a respiratory system, for, besides the purification of the blood in the lungs, the capillaries meet the air in sacs, which are distributed in various parts of the body. These are chiefly to make the body light but they also assist the lungs in their work. The bones are all very compact and firm: those of the neck move very freely allowing motion in all directions, while those of the back, to which the wings and legs are attached are fastened together so closely as to be almost immovable. The one main purpose and aim in the plan of structure seems to be fitness for flight. The firm muscles, the quickly beating heart, the light, compactly built body, the energy of all the parts, unite in the accomplishment of this end and so effectually do they fulfill their mission that the speed and power of flight in many birds are very great. The Hawks and their allies can fly from eighty to one hundred miles an hour, their swoop being much more rapid, and many of our smaller birds, as the Swallows and Warblers, fly almost or quite as rapidly and not only is their flight so swift, but they can keep on the wing for hours, or even days, with little or no rest. The eyes of an animal moving so constantly and so rapidly must have a different structure from that of man or other animals that move more slowly or it could not accomplish its purpose, accordingly we find all the parts of a bird's eye freely movable, and controlled by muscles. The eye of the Hawk, which lies flattened and far sighted as the bird sails slowly along the upper air, as soon as any prey is descried far below it, has every muscle ready for action and, as the bird sweeps down with the speed of wind, not only do the wings perform their part, not only do the talons and beak prepare for action, but the eye is all the time being drawn out round and full and when the earth is reached it is as keenly near sighted as it was far sighted an instant before and if the bird chance to turn toward the sun the third eyelid, the silvery nictitating membrane springs over the eye and shields it from harm.

But, however interesting the structure and action of the various parts of a bird's body, an extended consideration of them is foreign to our present purpose and so we pass on to notice very briefly the relations of birds to other animals. In their mode of reproduction and in the structure of some of the parts of the body birds have some affinity with the reptiles, but in other respects there is a greater resemblance to the mammals. Between these two classes, though not in all respects strictly intermediate, the birds are placed. There is no necessity for giving in this place a detailed classification and we will pass this part of the subject by simply stating that many naturalists arrange the birds in two groups, one embracing those that hatch the young in a weak condition and so are obliged to feed and care for them for some time, as is the case with the Robin and other of our common song birds; the other group embraces such birds as the Partridge and our common fowls, whose young are able as soon as hatched to run about and care to some extent for themselves.

Besides this general division some more specific arrangment is adopted. That most used by naturalists comprises seven orders which will be taken up in turn, though little need be said of most of them as they are not of special interest to the agriculturist and one order that of the Cursores or runners which is composed of birds such as the Ostrich and Cassowary will be omitted entirely. At this time only those species which are found within the limits of Vermont will be noticed.

The first order to be considered, Raptores or Birds of Prey, has not very much importance from an agricultural point of view. It is true that the frontier settlers suffer not a little from the depredations of Eagles and Hawks but in a thickly settled country such losses are not usually very large still these larger birds are injurious just so far as these depredations extend. The Owls, especially the smaller ones, deserve more favor as they destroy large numbers of rats, mice, moles and such animals, that do more or less damage to the crops. But more than this they devour a great many of the large night-flying moths, which come from, and in turn produce the large larvæ as the potato-worm and tobacco-worm. The common Screech Owl is especially serviceable in this way.

The Scansores or Climbers are of far greater importance, as many of them are most useful. Indeed it may be asserted with truth that all of this order which are found in Vermont are friends of the farmer. In warmer countries the numerous tribes of Parrots and similar birds are many of them very mischievous but our species are all insect eaters. We have only the Woodpeckers and Cuckoos. The Cuckoos are not of great importance as they are few in number. They eat a great many caterpillars and other insects and so are beneficial so far as they go. Few birds are of so great value to the farmer as the Woodpeckers. As Wilson most truly says this whole group seems to have been formed for the protection of our fruit and forest trees from the ravages of vermin. Among the many groundless and wholly false ideas in regard to birds is one which attributes to these birds the habit of sucking the sap of trees and which therefore bestows upon them the name of Sapsucker. The absurdity of such an idea does not seem to have prevented it from becoming prevalent in some places. Equally unfounded is the idea that these birds eat the wood of the trees they visit. Aside from the fact that they very rarly attack those trees which are rich in sweet sap, such as the maple, but, on the contrary spend nearly all their time on Apple-trees, Pines and other trees whose sap could hardly be regarded as inviting, they visit the trees most in September and other fall months and not so much in the Spring when the sap is most readily obtained. The whole structure of the bill and tongue is against any supposition that the birds eat sap or wood. One species is however an exception to these statements. This is the Yellow-bellied Woodpecker or Sap-sucker of the West. There is no doubt that the injury done by this bird has been greatly exaggerated but yet it seems doubtful whether it is wholly beneficial and it probably does eat some of the inner bark of trees while searching for insects. Its tongue is smooth and it differs in other respects from the true Woodpecker, but yet an examination of the stomachs of quite a number of these species has shown that their chief diet is probably insects. It seems probable that, notwithstanding the great outcry that has been raised against them in some sections of the country, this Yellow-bellied Woodpecker will yet be acknowledged as a very useful bird. But, setting aside this doubtful species, there remain six or seven other species, in regard to which there is no doubt and which, instead of injuring the trees they visit, most certainly benefit them.

As every fruit grower knows well his worst enemies are often the various borers. The borer is so hidden while at work that man finds it almost impossible to prevent its ravages and very difficult to even check them, but the Woodpecker finds just where the grub is located and with its sharp chisel-like bill easily digs into the wood and when the worm is reached the barbed tongue transfixes and draws it out. So deftly is the work done that a very small amount of wood is cut away and no injury done the tree. It is the uniform testimony of observers that those trees which have been oftenest pierced are most thrifty. In more than fifty apple orchards examined by Wilson the best trees without exception were those that had received frequent attacks from the Woodpecker. Many of the trees "were over sixty years old, their trunks covered with holes, while the branches were broad, luxuriant and loaded with fruit." "Of decayed trees more than three-fourths were untouched by the Woodpeckers."

Probably the most useful of our Vermont species is that called the Downy Woodpecker (*Picus pubescens*, *Linn.*) a black and white bird, usually not over six inches long, and another called the Hairy Woodpecker (*Picus villosus*, *Linn.*) which is very similar in appearance, though larger. These birds are quite common about orchards and should be encouraged to stay. Some of the larger species, at certain seasons, eat some corn and a little fruit but the amount they take is too small to be made any account of. The Red-headed Woodpecker is more destructive to fruit than any of the others. It eats apples, pears and such fruit, always selecting the ripest and best and it is said, besides this, to eat some corn, especially when it is in the milk. Notwithstanding all this their proper food is insects and there can be little doubt that they do far less to destroy, than to save fruit, for what they eat is only a small part of that they have saved from destruction by destroying thousands of insects.

Leaving this not very large but very useful group, let us pass on to the consideration of a very large and important order that of the Insessores or Perching-Birds. The species of this group are very numerous and the individuals are numbered by thousands and a very large number are of special interest to the agriculturist. In entering upon this part of our subject we are treading upon ground, every inch of which has been hotly contested and even now the discussion in regard to some species has by no means ceased.

Although there is a pretty general agreement among naturalists in regard to most of our birds those who have not made a special study of their habits and structure are by no means so nearly unanimous in their opinion. Because the ground to be passed over is contested, all theoretical views and all that is simply probable will be omitted and only what is believed to be fact well established and capable of proof will be presented. For this reason a careful consideration of what may be offered is desired.

Of course in so limited a space as is now at my command I can speak of only a few of the most important species and must leave unmentioned many others, of less interest perhaps, but yet not wholly unworthy of regard, such as the Humming Birds, Vireos, Warblers, Finches, etc. The Whippoorwills and Night Hawks are entirely harmless and very beneficial as they destroy in common with the Owls many of the nocturnal insects. The little Wrens are of considerable service in devouring the eggs and small larvae of insects, many of which are too minute to be seen by man and yet they may develop into formidable enemies. Still more useful in the same way is the common Titmouse, a bird regarded by many as very troublesome, and with some show of reason, for he may be seen not rarely tearing the buds from plants and after pulling them to pieces throwing them away. This certainly looks very much like mischief but, if any one will take the trouble to examine these castaway buds, every one will be found with the marks of a worm within it and this is the object which the bird seeks and so, while apparently doing harm, it is really preventing a much greater evil. Not only in this way does the Titmouse prove serviceable, but in many others.

The Chickadee or Black-capped Titmouse is one of our winter birds and after the leaves have dropped from the trees and bushes he may be seen carefully examining the bark and thrusting his sharp little bill into every crevice, often spending a long time upon a single branch and thousands of eggs left during the summer by the canker-worm, apple-worm and hosts of similar pests are thus prevented from doing harm, nor does it cease its labors in summer when the eggs of insects are not so plenty but it still wages unceasing warfare against the enemies of the farmer. Mr. Samuels in his exceedingly valuable work on the "Birds of New England" states that it has been calculated that a single pair of these Chicadees destroy five hundred grubs and caterpillars daily.

Probably no bird has been the subject of more dispute or the object of as many false opinions as our common Robin, and yet no bird is more familiarly known and none should be better understood. It is not very wonderful that when one sees his pet cherry-tree as it is just ripening its fruit, visited from morning till evening by hungry Robins, he should set down the birds as fit only for powder and it is undoubtedly trying to ones feelings to have the strawberry bed plundered and the raspberries and grapes, the ripening of which has been tenderly watched, missing, when the expectant owner goes to gather them. We are all very sensitive when anything affects our palates or our pockets. After all this allowance I yet hope to show that the Robin is a most beneficial and useful bird. The cherries and strawberries show us only one very small side of the question.

Let us consider a few facts which show what the Robin really is and what he does; some of these are from my own observation but most from various other sources. A Mr. Tronvelot living in Medford, Mass., has been experimenting for several years upon some of the American silk worms, especially upon one species. For the proper treatment of the worms and moths he has a large tract of land enclosed and covered with netting beneath which the worms feed. Mr. Tronvelot states that the various birds of the region destroyed about ninty-five per cent of these worms and that the Robins and Cat-birds were far the most troublesome. As he felt obliged in self defence to kill large numbers of them, he examined their stomachs and in no case found fruit but always worms alone. Yet this was all through the season and the grounds were surrounded with Scrub Oaks and Huckle-berry bushes, which were a part of the time loaded with fruit and this fruit was of course much easier to obtain than the worms. To ascertain how rapidly the birds would destroy the worms this gentleman placed two thousand of them on an oak in the very height of the the berry season and in a very few days they were all eaten by Robins and Cat Birds.

Any one that will watch the Robin closely can not fail of being struck by the diligence and activity it displays in the capture of worms. It seems to be an established fact that Robins must have animal food, especially when young. In reducing the number of the cut-worms and others like them the robin is especially efficient. These worms crawl out of the ground during the night and go back early in the morning before many birds are stirring but the Robin is a very early riser and devotes his mornings to the special work of exterminating these worms, which if allowed to increase, lay waste great tracts of country, destroying cabbages, turnips, potatoes and many of our most useful vegetables. A Mr. Flagg whom Mr. Samuels quotes as one who has watched the habits of this bird for a long time and very carefully, states as his belief that the Robin is almost exclusively an insectivorous bird and uses fruit only, as he expresses it, for desert, never as a general diet.

This gentleman tried various kinds of food for young Robins that he had taken. To some, worms and soaked bread were given, but all died; to others worms, bread and cherries, but most of these also died. Then he tried a variety of insect food and the manner in which the birds picked up the insects from the bottom of the cage, breaking any hard parts and their general treatment of the food, showed most plainly that the birds knew instinctively how to take such diet and moreover the birds grew vigorous and strong upon such food. Experiments like these show conclusively that as a rule, at least when young, the Robin *must* be fed with a variety of *insect* food or die. It is not simply a matter of choice, but of necessity which causes a pair of Robins with a nest full of young to catch the cut worms, canker worms and the like.

It will be interesting to note the amount of food needed by a growing bird and then we can judge better as to the number of noxious insects it is able to destroy. Recall if you please what was said at the outset in regard to the energy with which all the organs of a bird act and it will be more easy to understand what a large amount of food is needed to supply the waste necessarily caused by such activity of the circulatory, respiratory and other functions. It seems needful for the comfort of a bird that the stomach should be full nearly all the time. This matter can hardly be more clearly or accurately presented than by an abstract of a paper published a few years ago by Prof. Treadwell of Cambridge in the Proceedings of the Boston Society of Natural History(Vol. 6, p. 396). Two quite young birds were taken which were fed at first three worms daily. The number was increased the next day and on the third day eight were given each in the forenoon and in course of the day one died and on examination, its stomach was found to be empty. The other bird still strong, was given a larger allowance which was increased to thirty-one worms on the seventh day. From this time the bird and its food were weighed daily. It was found in this way that not until the fourteenth day when sixty-eight worms, or thirty-four dwts. were given the bird that it began to gain in weight. At this time the bird weighed twenty-four dwts. so that its daily food weighed over forty-one per cent, more than itself. The sixty-eight worms measured about fourteen feet. After a time the food was varied and twenty-three dwts. of raw beef were given the bird and with it large quantities of earth, gravel and water were taken. If a man were to eat as much proportionally he would consume in twenty-four hours over seventy pounds of clear beef and drink five or six gallons of water. When the bird had reached its full size its requirements were reduced to about eighteen dwts. of clear meat or double that amount of worms, the latter not being very concentrated food, and it continued to take this amount up to the time the article was presented. I am well aware that it seems impossible for the parent birds to supply the young with so large a quantity of food but we cannot suppose that a bird would eat any more in the quiet life of a cage than when freely exercising in its natural state. If now a Robin needs so great a number of worms, not to fatten it, but simply to keep it from losing flesh, what a great benefactor of the agriculturist this bird must be! Between two and three hundred full sized worms daily is not too large an allowance. What is true in this respect of the Robin is equally true of all our insect eating birds and the Robin is spoken of so much in detail chiefly that it may furnish a sample of what hosts of others do.

It is not pretended that these facts prove that Robins and other birds do not eat cherries and other fruit. It is not desirable that only one side, even though it be the most favorable, should be regarded, but all the different views should be taken and compared and thus we may hope to reach a correct result. Estimate as largely as you will the loss resulting from the destruction of fruit and as little as you honestly can the evils which would have resulted from the ravages of the insects which the Robins destroy and the account when balanced, will eventually stand largely in favor of the birds. Fruits last only for a time and the amount the Robin destroys is at most quite limited but the injurious insects are to be found in some forms the year around and, while most of the Robins migrate farther South, some of them stay all winter even in this northern climate. It is full time this matter were considered and the vexation on account of the loss of a few cherries or other fruit, prevented from avenging itself in a way that brings so great evil.

All that is needed to rectify the many errors so common, is a careful and unprejudiced examination of the question. It may be true that a person who raises small fruits as an essential part of his business, receives more harm than good, from the birds, but I find it hard to believe this for it seems as if the injury occasioned by an unchecked increase of the cankerworms and various other like insects would be greater than the worst inflicted by the birds. Indeed it is difficult to see how any fruit at all could be raised, if the ravages of the worms were unchecked by them and for this reason any one who meets with considerable losses from them may console himself with the thought that in all probability he would have had none at all if the birds had all been killed a season or two before, as he sometimes wishes they had been, so that all that he is able to gather of his fruit is so much saved.

A bird quite as much disliked by fruit growers as the robin is the Cedar Bird, or Cherry Bird, so called on account of its fondness for cherries and the berries of the Red Cedar. These birds come from the South quite early in the spring in small flocks and remain all summer. During most of this time they live upon insects and are all the while of great service but in cherry time they help themselves to their favorite fruit and then all their good deeds are forgotten and they too often fall victims to unjust condemnation. I think that nothing more is needful to secure the protection instead of destruction of these birds, than for any one to watch them closely, not merely during the cherry season but all the while they are with us from early spring till autumn. There are many who rarely if ever see this and other birds except during the few days, or weeks at most, in which they are injurious, forgetting entirely to look after them or to consider their habits at other times and so great errors very easily arise.

As the Bobolink is one of our most common meadow songsters and is withal a great favorite with many, a word or two in regard to it will not be out of place. So far as agriculture is concerned this bird is of less importance than many others, but yet it has some interest when viewed only in this light. In the South they are usually disliked because they pay more frequent visits to the rice fields than is pleasant for the owners and indeed they often do much damage to the crops though sometimes very beneficial to the cotton as we shall see before closing. In New England however it seems to have left its love foi grain behind it and here it eats, some grass-seeds indeed, but for the most part its food consists of beetles, crickets, grasshoppers, and all sorts of insects. They remain with us only during the warmest part of the year, not often arriving before the middle of May and leaving in large flocks early in September. Even if the Bobolinks were not the useful birds they are to us we could well afford to tolerate their presence on account of the joyous, tinkling warble that they so constantly give us during the first part of their stay seeming the very embodiment of buoyant life and he must be very melancholy who can long listen to their song without catching in spite of himself something of its cheeriness and hugging himself for very joy.

One of our common birds, and one that should be highly esteemed, is the Cat Bird, as it is one of the greatest enemies of the various kinds of insects we have. The Blue Bird is an universal favorite and deserves so to be, as besides being of a cheerful disposition it does good service in warring against the insects. The Barn, Cliff and Bank swallows all capture a great variety of the flying insects and sometimes destroy the so called apple-slugs in great numbers.

Probably very few persons have any idea what the state of things would be if the birds were all destroyed, other things remaining as they now are. It can not be unprofitable for us to devote a few words to this part of our subject. There are in the State of Vermont probably not less than eight hundred species of Lepidopterous insects(i. e. the moths and butterflies,) and in the whole United States there are not less, probably, than four thousand. But leaving the rest of the states let us confine ourselves to our own, and see what results we can obtain. If we suppose the number of species in this state to be eight hundred the increase will be something like this: each female lays on the average three hundred and fifty eggs but we will place the number at three hundred, now suppose that in this year 1871, there exist only one pair of each species, there would be during the year 240,000 eggs produced which would develop into 240,000 caterpillars. If half of these were females, next year we should have 120,000 pairs of insects which would produce 36,000,000 of caterpillars for 1873, and so on, so that in five years there would come from the unchecked increase of only one pair of each species 1215,000,000,000,000 of caterpillars or two hundred millions for every single acre in the state. It is true that as the arrangement of things now is not one in a hundred, if indeed one in thousands of these eggs ever reaches maturity but the great agents of destruction are the birds. The various species of ichneuman flies and other parasites destroy great numbers however. Making all possible deductions on account of all the destructive influences except the birds, we have left a very large figure, and if this is multiplied by the number of pairs actually living on and, as all know, of some kinds there are thousands, the product is something appalling. But astonishing as this view of the case is it is by no means complete.

The Lepidoptera constitute only a small part of the insect world. It is indeed that which probably contains most injurious insects but other groups are not to be overlooked. We have, for instance, the vast numbers of beetles, to which group belong the various tree borers, weevils and curculios; others of this tribe devour the leaves, bark, flowers and fruit of trees and plants, and many very troublesome bugs belong to this group. Then among the grasshoppers, locusts, crickets and the like there are many pests. Among the flies there are the Hessian fly, wheat fly, bot flies and others. There are in other groups different kinds of more or less troublesome insects. So that if we bring all these insect foes together we find an army of enormous size, an army sufficient, if allowed to go on unchecked, to ravage the most fertile country more hopelessly than the wildest horde of savages or the fircest conflagration. Man is almost powerless to check this invading host, all his ingenuity and all his knowledge has been again and again brought to bear upon the evil and with so small results as to be almost in vain. To show how far man's resources avail him in this matter let me quote a fact or two from an article by Dr. Brewer in one of our popular periodicals. In 1852 the forests of Lithuania were ravaged by the caterpillars of one of the butterflies and although, aware of the danger, the landholders set the peasantry at work collecting the eggs, larvæ and adults and used every means in their power to prevent the evil yet it continued till thousands of acres were ruined. The total loss must have been enormous; that in a single district was estimated at $58,000,000. And yet no one familiar with their habits can doubt that had not the European Jays been almost exterminated in these same forests a few years before, much if not all this great loss would have been saved.

The loss by the May chaffers in three districts of the Hartz Mountains was estimated to be in 1866 one and a half millions of dollars and this is not an unusual loss so far as I am aware and yet in these same districts some of the most useful birds are proscribed.

If there is a race of beings on earth that is protected from destruction by its relations to the general economy of nature that race is that of the birds. Vengeance swift and terrible descends upon those who will not learn that they are important, nay even necessary to the success of all agricultural pursuits. While we may be much aided by those insects that destroy others of their kind, we must rely chiefly on the birds and in so doing we shall lean upon no broken reed. While man stands aghast at the prospects before him, as he contemplates his insect foes, the birds are ready and eager and able to help him if only he will allow them to do so. Rapid as is the increase of insects the birds, if unmolested, will generally keep them in check. Dr. Brewer gives an instance or two to show the efficiency of the aid birds can give that I cannot resist the desire to quote. In the fall of 1868 there was a great cry from the Southern seaboard states that the cotton worm was ruining the crops. The worms had appeared over so large an extent of country that it seemed hopeless to attempt to exterminate them, but just at this time the Bobolinks passed along the region on their Southward journey and, instead of as usual visiting the rice fields, they went at the cotton fields and in a few hours the evil that had seemed irremediable, was removed and the crops saved. Again in the Spring of 1867 the Grasshoppers were hatching in such numbers in a part of Kansas that the crops seemed doomed to speedy ruin but just at this time large flocks of the Yellow-headed Black Bird passed through the region and entirely destroyed the insects. Many such instances might be given all showing the great benefits the birds are all the while conferring upon the agriculturists.

I should not treat this subject fairly if I passed over some birds of a different disposition from those heretofore mentioned. It must be admitted I think by most observers that there are injurious birds. And yet among these there are some, if not all, that have valliant defenders.

The number of species that may be set down as injurious is not very large but some of them are very numerous in individuals and as they assemble in large flocks they may do considerable damage. There are common in Vermont four different species of Blackbirds. Some of these do very little damage to the crops and do much good by destroying insects. So much evil do they prevent that in some cases where they have been placed under the ban and indiscriminately slaughtered there have followed extensive and destructive depredations from grubs and worms. But the most common of all the Black birds is that called Crow Blackbird. These birds descend upon the cornfields in large flocks pulling up and swallowing the grain with great gusto and again when it is in the milk they tear open the husks and prevent many an ear from ever coming to maturity. And yet with all their faults they destroy a great many insects.

As to the Crow there is considerable discussion. Dr. Brewer contends, in an article in the Atlantic Monthly, that the crow is, on the whole, a useful bird, but other naturalists doubt the correctness of this conclusion, and it seems reasonable to believe that the Crow does far more harm than good. In the winter and early spring Crows live almost wholly upon insects and of course during this time they are beneficial, In May or early June they busy themselves in pulling up the corn, sometimes making it necessary to replant large tracts. Certainly they are none other than thieves during this time. About this same time too they are watching the smaller birds in their domestic operations, and when the eggs are laid and the young hatched they make many a meal from them. If what has been said in regard to these smaller birds be true, it is easy to see that in destroying their eggs and young the Crow is preventing the destruction of myriads of injurious insects and so is a most harmful bird as long as he continues in this predatory work. Mr. Samuels thinks that a crow takes about eight ounces of food daily and so he is able of course to eat no small number of birds and eggs during the season. Mr. Samuel's calculation gives, as the result of one day's work for a crow, the destruction of birds that could fairly be presumed to have destroyed during the season nearly 100,000 insects had they lived. After the corn has grown too large and the birds have flown from the nest the crow betakes himself again to the search for insects and becomes a useful member of society. But, as his evil deeds are far greater than his good ones, we must set him down as an outlaw. An ingenious mode of catching these birds is given by Wilson. A live crow is securely fastened to the ground with his feet upwards. In this condition his cries are loud and frequent. As soon as other crows fly down about him he grasps them hoping to relieve himself of the fetters that hold him to the ground and in this way the prisoner may be taken and the trap is all set for another.

The Blue Jay is guilty of similar misdemeanors, for this bird delights to rob the nests of the Thrushes and Warblers of both eggs and young. It also devours insects, beech nuts and other seeds and fruits. Equally as guilty of robbing the nests of insect eating birds is the Canada Jay. This bird is not common except in the northern part of the state. Mr. Samuels says that he has known a pair of these birds to carry off the young of four nests of the Snow Bird in one forenoon.

Besides these three groups, the Crows, the Blackbirds and the Jays there are a few other birds that are to some extent injurious and in saying this I of course do not mean that no others are ever guilty of damaging fruit or crops, but that in these the injury done is not compensated by any evuivalent benefit as it is in the case of the others. The Purple Finch, though a fine looking bird, is disliked on account of his habit of feeding on the buds and blossoms of fruit trees. The Great Northern Shrike, or Butcher bird is indirectly injurious, at least sometimes, as it destroys the smaller birds and so prevents the benefits they might have brought to the farmer. But at most the really injurious birds of this order are very few in the number of species and except the Crows and Black birds are few in individuals.

Of the three remaining orders but little need be said. The Rasores, an order which includes such birds as the Grouse and Wild Pigeon, are all of them seed eaters though also eating insects, and where they descend upon grain fields in any considerable numbers they may do much damage, but, as none of them are found in large numbers in our state, they can hardly be said to be injurious for they confine themselves to the woods for the most part and seldom attempt to rob the fields.

The Waders and Swimmers, from their habits of life are necessarily seldom brought under the notice of the farmer, and all that is to be said in regard to them is, that, so far as is known, they do no harm whatever and some of them do destroy mice and insects and so are useful though not to any very important extent.

Allow me in closing to earnestly ask all who have read the facts and arguments herein presented to give them careful thought and to test them by full and candid observation and see whether they are true or not. It has been impossible in the allotted time to bring clearly into view *every* side of the question, much more might be said in regard to many points but, while these have necessarily been imperfectly treated, there has been a constant desire and purpose to bring out fully those points which have the most practical importance. All that could be said against the usefulness of the birds treated has been given, it is believed, its due weight and what has been said upon the other side of the question has not been, intentionally at least, overestimated. Certainly it is true that the arguments brought forward have not been adduced for the sake of any favorite theory nor out of any sentimental regard for the beauty of the feathered friends, but simply and solely because the facts in the case seem to support them.

A great deal of sentimentalism in regard to the beautiful plumage and the sweet songs of the birds has been written and most pathetic appeals have been based thereupon to induce people to cease their molestations. This is all well in its place. Certainly no words can describe too vividly the exquisite softness of coloring, the elegance and gracefulness of form, or the melodiousness of song of very many of our birds; Longfellow's "Birds of Killingworth" is a picture as true as it is poetical, but sentiment, however well expressed, cannot stand against real or apparent self interest and is not a firm enough foundation for a plain, sober argument and in a paper intended not to amuse but to present simple facts in their clearest light there is no place for such things. Not to the sympathy, nor to the love of the beautiful, but to the judgement and common sense is the appeal here made.

It is not at all unlikely that many who will see the statements just presented will recall more than one observation of their own that seems to conflict directly with them. While in no way intending to declare such observations incorrect I would yet remind you that they may not be wholly conclusive. What has been given as fact is the result, not of passing observations, but of careful investigation. Very naturally nothing makes one more sure of the truth of anything than the fact that he has seen it with his own eyes. But unfortunately it is not every pair of eyes that sees what is going on with scientific accuracy and in not a few of nature's operations appearances are very deceptive and so the inferences drawn from them must be erroneous. Many an one looks merely at the surface of things, imagines that he has seen all there is and acting accordingly most resolutely maintains that he is guided by the teachings of nature. He may see a woodpecker drilling into a tree and infers that it is after sap and is doing damage; or, he sees the Chickadee pulling off buds and so sets both these birds down as only fit for destruction and usually includes in his list all that resemble them. Observation and reasoning of this sort are far too common and the result of it is that thousands of dollars are lost every year.

The relation of birds to agriculture is not merely a question involving the killing or protecting a few birds, but it involves the welfare of the agricultural interests of the land and if at this time I shall only succeed in convincing a few of the importance of the matter and so lead them to think of it and investigate it for themselves I shall be content.

◆

Qualitative Analysis of the Mineral Springs of Essex County, Vermont. By Hiram A. Cutting, A. M., M. D., State Geologist, and Curator of the State Cabinet, Lunenburgh, Vermont.

(*Continued from page* 20.)

Following the Connecticut River down a few rods from the Lunenburgh Chalybeate Spring, before analyzed, we find some half dozen small springs issuing from the bank within the space of a dozen rods, all of which are more or less chalybeate. One of them is however sufficiently pure to be used for all household purposes, by the family of James Phelps, Esq., on whose land they are situated. This spring contains about 4½ grains of mineral matter to the gallon and from this the increase in different springs is up to 20 grains per gallon.

In all the iron is the principle ingredient, and is held in solution by carbonic acid. The water is clear and pure when first drawn, but soon an ochreous sediment will be deposited on the bottom of the pail, or by boiling, which is hydrated peroxide of iron, liberated by the escape of the carbonic acid. By analysis I find the ingredients of these springs the same as that previously published. Though well impregnated as a tonic water, and valuable as such when drank on the premises, the easy separation of the iron renders it unfit for transportation to great distances. Those springs are not as cold nor as regular in the amount of water discharged as the spring belonging to this group previously described, yet are never dry, but are weaker in wet weather, as the amount of water is increased without a perceptible increase of mineral matter.

Mineral Springs of Concord.—About one half mile from West Concord, near the road leading to Concord Corners, is a sulphated chalybeate spring on land now owned by Harvey Judevine, Esq. This spring has been dug out, but apparently not at its head, and now runs in an aqueduct to the dwelling of W. W. Osgood, where they make some use of it for household purposes as there is no other water easily accessible.

This spring issues from the talcose schist formation, and doubtless derives its sulphurous qualities from the oxidation of iron pyrites in the strata from which it issues. It is strongly impregnated with sulphuretted hydrogen which makes the water seem more fully impregnated with mineral matter than the analysis shows. It contains 23 grains of mineral matter to the gallon, which consists of:

Peroxide of Iron from Protosulphate,
Sulphuric Acid,
Silicic Acid,
Carbonate of Lime,
Carbonate of Soda,

Sulphur, a trace,
Organic Matter.

The ingredients of this spring resemble in combination, some of the celebrated sulphuretted waters of Germany which have a world wide reputation. They are not however so strongly impregnated.

Saline Spring.—There is also in West Concord a mineral spring on the bank of Moose River a few rods above the bridge that crosses the river on the farm of Wm. Gould, Esq., about midway between West Concord Village and Saint Johnsbury East Village.

This is a saline spring, differing materially from any other known spring in this section. It is situated near the junction of the talcose schists of Concord, and the mica schists of Waterford, really upon the connecting line, as near as can be determined, and probably issues from between the strata. It is not a strong mineral water, containing only nine and one-fourth grains of mineral matter to the gallon, and evolves no gas. It consists of:

Carbonate of Magnesia,
Carbonate of Lime,
Chloride of Sodium,
Silicon,
Silicic Acid,
Sulphuric Acid, and
Organic Matter.

It seems to vary from time to time in its proportions, sometimes being much more acid and at others more alkaline, and it is consequently of apparently different strengths.

This spring has a reputation in the neighborhood as a specific for kidney diseases, and doubtless a regular use of its waters might be advantageous in dyspepsia also. I am sure that wonderful cures are narrated of some Vermont springs that really seem of less worth, by analysis, than this or any other analyzed in Essex County. But I feel that commodious and popular hotels for summer resort, do more to increase the popularity of mineral springs than the best ingredients ever prepared in nature's laboratory, as it is necessary that an invalid should be pleased in mind as well as cured in body.

Catalogue of Cryptogamous or Flowerless Plants of Vermont. By Chas. C. Frost, Brattleboro, Vermont.

(*Continued from page* 117.)

MUSCI.—Mosses.

Hypnum paludosum, Sulliv.
Swamps.

H. triquetrum, L.
On ground in woods.

H. brevirostre, Ehrh.
Mountain Swamps.

H. splendens, Hedw.
On ground in woods,

H. umbratum, Ehrh.
Shady rocks and swamps.

H. Alleghaniense, C. Mull.
Rocky margins of rivulets.

H. Sullivantii, Spruce.
On rocks in woods.

H. strigosum, Hoffm.
Hillsides in woods.

H. piliferum, Schreb.
On ground &c. in dense woods.

H. Boscii, Schwaegr.
On grounds in hilly districts.

H. serrulatum, Hedw.
On ground in dry woods.

H. rusciforme, Weis.
Mountain rivulets.

H. recurvans, Schwaegr.
Decaying logs.

H. demissum, Wils.
Moist exposed stones or rocks.

H. eugyrium, Bryol. Europ.
Rocks and stones near streams.

H. palustre, L.
Mountain rivulets.

H. ochraceum, Turner.
Mountain rivulets.

H. cuspidatum, L.
Marshy places.

H. Schreberi, Willd.
On ground in moist woods.

H. cordifolium, Hedw.
Swamps.

H. stramineum, Dickson.
Sphagnous swamps.

H. uncinatum, Hedw.
Swamps and bogs.

H. aduncum, Hedw.
Swamps and bogs.

◆

SCIENTIFIC INTELLIGENCE AND EDITORIAL.

Earthquake.—On the 20th of July at five minutes before one o'clock A. M. the shock of an earthquake was felt throughout New England. In central New Hampshire two distinct shocks were felt. In the Connecticut River Valley the shock was the hardest. The swaying motion was greater than on the 20th of October 1870, but it seemed to do less damage, though bells were rung, doors opened and shut, and other usual disturbances made. It continued about thirty seconds and was accompanied with a deep rumbling sound. In the State of Connecticut it was more severe, breaking windows and doing other damage.

Meeting of the Dartmouth Microscopic Club.—The semi-annual meeting of this Club was held at Hanover, Jun. 7th. Vice President, Prof. L. B. Hall in the chair.

Dr. H. A. Cutting read a paper on the Pollen brought down from the atmosphere in showers. First: he showed that much of the haziness of the atmosphere is from the grains of pollen floating in it; second: though nearly all of our plants blossom in the spring, pollen is found floating in the atmosphere during the entire summer; third: that a great excess of the grains found at all seasons are from the Conifers, mostly Pines: quest.: Where does it come from so late in the season? Is it retained fresh in the atmosphere during the summer, or does it come from more northern regions? Certainly some pollen grains are from European vegetation. This paper was illustrated by microscopic specimens.

Prof. L. B. Hall read a paper on Trichinæ, giving their habits from observation and the result of several experiments, showing that after they were encysted in the muscles they could not be propagated. He had fed to rats flesh containing multitudes of encysted trichinæ without propagating them, and as the rat was probably as easily infected as any animal; it went far to show that they could not be thus propagated, consequently the cyst was a tomb from which the trichinæ could not liberate themselves. From this he would infer that after a time these cysts would be absorbed by the natural process of absorption and all trace of the former infection would then be lost. This paper was illustrated by microscopic specimens.

Associate Editor.—Dr. H. A. Cutting, State Geologist and Curator of the State Cabinet, has recently been added to our staff as associate editor.

Doryphora decem-lineata.—This pest made its appearance in Vermont for the first time, this season. It has only been seen in small numbers on lines of railroad coming through from the West. It has doubtless been transported in the cars bringing freights from infested localities. It seems to relish Vermont potatoes, and doubtless another season will give us a more intimate acquaintance with its habits.

Lepidoptera.—List of Lepidoptera collected in Troy Vt., during the present season, by James C. Kennedy:

Papilio turnus.
" asterias.
Colias edusa.
Argynnis aphrodite.
" myrina.
" ——.
Erebia nephele.
Debis amdromacha.
Glaucopis latreillana.
Deilephila chamænerii.
Thyreus nessus.
Clisiocampa decipiens.
Arctia parthenice.
" rubricosa.
" isabella.
Orgyia leucostigma.
Dasychira clandestina.
Edema albifrons.
" producta.
Acoloithus falsarius.
Pieris oleracea.
" rapæ.
Danais archippus.
Grapta interrogationis.
" comma.
Vanessa antiopa.
" milberti.
Alypia ——.
Ceratomia quadricornis.
Sesia thysbe.
Attacus polyphemus.
Gastropacha americana.
Spilosoma acrea.
" textor.
" virginica.
" ——.
Heterocampa biundata.
Datana ministra.
Nudaria mendica.
Lycomorpha pholus.
Lapara bombycoides.

For Sale or Exchange.—Dr. H. A. Cutting of Lunenburgh, Vt., offers for sale or exchange a great variety of microscopic objects mounted by the new Damar Method, specimens of Vermont Minerals and Insects, also a few duplicates of Vermont Birds. He will mount specimens to order whenever desired.

Change of Medical Instruction.—Medical Instruction in Harvard University Medical School has recently been changed so that the various branches of medical science are taken up by the student in a natural and systematic order. The Course is divided into three years: the first year Anatomy, Physiology and General Chemistry, are taken up: the second, Medical Chemisty, Materia Medica, Pathological Anatomy, Theory and Practice of Medicine, Surgery and Clinical Surgery; the third, Pathological Anatomy, Therapeutics, Obstetrics, Theory and Practice of Medicine, Clinical Medicine, Surgery and Clinical Surgery. Examinations are held at the close of each year.

* * *

BIBLIOGRAPHICAL NOTICES.

Proceedings of the Second Annual Session of the American Philological Association, held at Rochester, N. Y., July, 1870.

This Association now consists of above 150 members, most of them occupying linguistic professorships in our colleges. The meetings are largely attended, and the matter brought before them is varied and of great importance to that branch of science.

Vermont Historical Gazetteer.—A Magazine embracing a Digest of the History of each Town, Civil, Educational, Religious, Geological and Literary. pp. 1200. Edited and Published by Abby Maria Hemenway, Compiler of "The Poets and Poetry of Vermont." Burlington, Vt. $6,00.

This magazine contains besides its voluminous civil and other historical matter. several papers upon the geology, mineralogy, and physical geography of Vermont, by resident scientific men. The work has been carried through the press by the indefatigable energy and enterprise of the authoress, and deserves to be encouraged. It will be found interesting not only to Vermonters, but to all lovers of history.

Transactions of the American Ophthalmological Society. Seventh Annual Meeting, Newport, July, 1870. pp. 151. From Dr. Noyes, 73 Madison Avenue, New York. $2,00.

This volume contains 25 important articles on Ophthalmological subjects read by the members at their last meeting. They are illustrated by several cuts and diagrams. The authors are mostly eminent practitioners.

The American Journal of Obstetrics and Diseases of Women and Children. Edited by B. F. Dawson, M. D. Associate Editors, E. Noegerath, M. D., and A. Jacobi, M. D. Published by Wm. Baldwin & Co. New York. $5,00, yearly.

This is the only journal in America especially devoted to the diseases of Women and Children. It ranks among the ablest of our country; its matter is mostly original, the quarterly reports are gleanings from the best American and Foreign medical literature. No. 1 Vol. 4, contains 192 pages, which is its usual size. The typographical work is also good.

The Medical World.—A Monthly Journal of American and Foreign Medical, Physiological, Surgical, and Chemical Literature, Criticism, and News. Edited by R. A. Vance, M. D. Published by Wm. Baldwin & Co., New York. $1,50 a year.

Report of the United States Commissioners to the Paris Universal Exposition, 1867. Published under Direction of the Secretary of State by Authority of the Senate of the United States. Edited by Wm. P. Blake Commissioner of the State of California. 6 Volumes. Department of State.

A Report on Barracks and Hospitals with Description of Military Posts. Circular No. 4, 1870. pp. 494. Surgeon General's Office.

Second Annual Report of the State Board of Health of Massachusetts, Jan. 1871.

New Remedies. A Quarterly Retrospect of Therapeutics, Pharmacy, and allied Subjects. Edited by Horatio C. Wood, Jr., M. D. Professor of Medical Botany in the University of Pennsylvania, Physician to the Philadelphia Hospital, &c. Published by Wm. Wood & Co., New York. $2. per annum.

This work is neatly gotten up and will undoubtedly please many physicians who have not the opportunities of extensive journal reading, *Medical Education in America.* Being the Annual Address read before the Massachusetts Medical Society, June 7, 1871. By Henry J. Bigelow, M. D., Professor of Surgery in Harvard University.

United States Sanitary Commission Memoirs. Completion of the Surgical Memoirs of the War of the Rebellion. Vol. 2. Containing:

I. Analysis of four hundred and thirty-nine recorded Amputations in the contiguity of the lower extremity. By Stephen Smith, M. D.

II Investigations upon the Nature, Causes and Treatment of Hospital Gangrene as it prevailed in the Confederate Armies. 1861-1865. By Joseph Jones, M. D., Professor of Chemistry in the Medical Departments of the University of Louisiana; formerly Surgeon in the Provisional Army of the Confederate States. With five chromolithographic plates. 1 vol. 8vo. $6.50.

Vol. I. Surgical Memoirs contains three treatises by Dr. Lidell on the Wounds of the blood vessels, Pyæmia, etc. 10 plates. Price $6.50. Published and for sale by HURD & HOUGHTON, New York, THE RIVERSIDE PRESS, Cambridge.

The series of the Sanitary Commission Memoirs is comprised of:
I. Historical Memoirs. C. J. Stille. 1 vol. $3.50.
II. Statistical Memoirs. B. A. Gould. 1 vol. $6.50.
III. Medical Memoirs. Edited by Austin Flint, M. D. 1 vol. $6.50.
IV. Surgical Memoirs. Edited by F. H. Hamilton, M. D. 2 vols. $13.00.

Any or all of these volumes can be obtained of the publishers direct or through any bookseller.

TRANSACTIONS

OF THE

ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

NOVEMBER 1, 1870.

Regular Meeting at Westfield.

President HINMAN in the chair.

Communication.—Rev. Thomas Mackie read a paper on the Minerals of Missisquoi Valley, accompanied with explanations from numerous specimens. He presented some specimens of gold which he had washed from the alluvium in Westfield. Also specimens of gold bearing rocks from the same locality.

Drift.—Rev. S. R. Hall, LL. D., made some observations on the Drift of Orleans and Franklin counties. He had noticed striæ and polished surfaces on the rocks on the summit of Jay Peak over four thousand feet high. Many boulders from the sandstone formation in Franklin county had come over the peaks of the highest mountains and were distributed over Orleans county and farther southward even as far as Windsor. He made further observations on the gold and serpentine rocks in the Missisquoi Valley, there was scarcely a stream in that section that gold could not be washed from its bed, but not in sufficient quantities to pay expences.

Chromite.—Rev. T. Mackie made some observations on the specimens of chromite which were presented to the Society by Thomas Trumpass.

Dendritic Pebbles.—J. M. Currier presented several specimens of denritic pebbles from the alluvial deposits in Derby near Lake Memphremagog, and remarked upon their origin.

Botany.—Mrs. A. A. Smith read a paper on structural botany with a view to the encouragement of a more general study of that branch of science.

Cryptogamia.—J. M. Currier remarked upon the cryptogamia of this region, and exhibited some illustrative microscopic specimens.

Acting Members.—Timothy Holt, Geo. F. Legget and S. J. Donaldson, M. D., of Derby, E. Harrington of Coventry, Rev. Thomas Mackie, A. H. Richardson and

N. C. Hoyt, of Westfield, were duly elected as acting members.

Donations to Museum.—Tarantula, centipede and scorpion from the Indian Territory, *from Lieut., S. P. Jocelyn, of the U. S. Army;* 65 specimens of shells from Cape Elizabeth, Portland, Me., 3, from Marblehead, Mass., 5, from Vassalboro, Me., 49, from Troy, Vt., 1 specimen of fossiliferous limestone from Albion, Me., and 94 entomological specimens from Troy, Vt., *from J. C. Kennedy;* 1 specimen of calcareous tufa from Owl's Head, P. Q., *from A. Randall;* 20 specimens of rocks illustrative of the general lithological features of Orleans county, *from J. M. Currier;* 1 turtle shell, and several specimens of chromite and serpentine from Westfield, *from J. H. Miller;* 1 specimen of talcose slate showing a folding of the strata to a very acute angle, *from Clark Hitchcock.*

ARCHIVES OF SCIENCE.

VOL. I. OCTOBER, 1872. NO. V.

Catalogue of the Flowering Plants of Vermont. By George H. Perkins, Ph. D., Professor of Zoölogy, Geology and Botany, in the University of Vermont.

The "History of Vermont" by Zadock Thompson, published in 1842, contains an interesting and valuable chapter on the "Botany of Vermont" in which a very excellent list of the plants of the state is given. However complete such a list may have been at the time of its publication it must necessarily be more or less deficient after the lapse of thirty years. During this time new species have been introduced, others have been discovered, some that were supposed to be very limited in range have been found in many new localities, the scientific naming and arrangement has changed somewhat, and so a new catalogue of the plants of the state will not be without value. The list just mentioned has been freely consulted and so much of it as seems best has been incorporated in that which follows. The extensive herbarium of the late Prof. Joseph Torrey has also furnished material aid in the present list. A list of the Cryptogamous plants of the state, including, thus far, the Acrogens, has been published during the past year in this Journal by Mr. Chas. C. Frost of Brattleborough, and to the kind assistance of this gentleman, who has for quite a number of years studied the Flora of this state, much that is of value in this list is due. And the writer takes pleasure in acknowledging that, although he has collected and studied by far the larger part of the species here given, yet the assistance derived from the sources mentioned has been so great, that it is proper for him to claim but a small share of whatever credit may be due the work.

A full exhibit of the synonymy of each species has been deemed unnecessary but, when synonymes have occured which are of nearly equal authority as the name adopted, such are given in connection with it. Popular names of such species as have received them, are given but no attempt has been made to furnish common names for plants that have none. Introduced species are indicated by a star (*), and synonymes by smaller type. If any one who may meet with this list has any corrections or additions to offer, they will be most thankfully received.

Class I, EXOGENS.

Group I, POLYPETALOUS ANGIOSPERMS.

Order—RANUNCULACEÆ.

CLEMATIS VERTICILLARIS, DC. Atragene americana, Linn. *American Atragene.* Occurs sparingly in open woods or, more commonly, in shaded, rocky ground. Blooms about the middle of May.

C. VIORNA, Wild. Given in Thompson's list as found at Castleton by Mrs. Carr, also found abundantly just across the Connecticut river from Brattleborough on Wantastiquet Mountain on a sheltered southern slope by C. C. Frost.

C. VIRGINIANA, L. *Common clematis.* Abundant along the borders of streams and in damp open ground where it climbs over alders and other shrubs or trees. July.

ANEMONE MULTIFIDA, DC. *Cleft anemone.* Common about Burlington in rocky soil, but rare elsewhere in the State. May.

A. CYLINDRICA, Gray. *Anemone.* Found sparingly in quite a number of localities. June.

A. VIRGINIANA, L. *Long-fruited anemone.* Common in dry soil. June. Var. ALBA is also common.

A. NEMOROSA, L. *Wind Flower.* Very abundant especially in open woods and on shaded banks. April.

A. PENNSYLVANICA, L. Common. June or July.

HEPATICA TRILOBA, Chaix. *Liverwort. Hepatica.* Very abundant and variable in color. April.

H. TRILOBA, Chaix., var. ACUTA. H. ACUTILOBA, DC. Not so common as the preceding of which it seems to be only a variety as I have found specimens distinctly "acuti loba" growing with the typical "triloba" and with these, intermediate forms. April.

THALICTRUM ANEMONOIDES, Michx. Anemone thalictroides, L. *Rue anemone.* Woods. April and May. Brattleborough. C. C. Frost.

T. DIOICUM, L. *Meadow Rue.* Common on rocky hillsides and along streams. June.

T. CORNUTI, L. *Meadow Rue.* Very common on interval and meadow land. July.

RANUNCULUS AQUATILIS, L., var. CAPILLACEUS. Ranunculus divaricatus, Schr. *Water-Crowfoot.* Slow streams. June.

R. MULTIFIDUS, Pursh. R, Purshii, Rich. Not uncommon in ponds and sluggish streams. May.

R. FLAMMULA, L., var. REPTANS, Gray. R. reptans, L. Rocks along the shore of Lake Champlain and borders of large streams. July.

R. ABORTIVUS, L. Common in shaded places. May.

R. SCELERATUS, L. *Cursed Crowfoot.* Not common. June.

R. RECURVATUS, Poir. *Early Crowfoot.* Moist hillsides. June.

R. PENNSYLVANICUS, L. Common in low ground. July.

R. FASCICULARIS, Muhl. *Early Crowfoot.* Low moist ground; not common. April.

R. REPENS, L. *Creeping Crowfoot.* Not common; low grounds; June.

R. *BULBOSUS, L. Rare; hillsides; June.

R. *ACRIS, L. *Common Buttercups.* Very common everywhere. Last of June.

CALTHA PALUSTRIS, L. *Cowslip. Marsh Marigold.* Very abundant in wet ground. April.

COPTIS TRIFOLIA, Salisb. *Goldthread.* Very common in clearings and about the borders of groves and open woods. May.

TROLLIUS LAXUS, Salisb. *Globe Flower.* There is one specimen of this species in the herbarium of the University of Vermont with the Vermont flowers but no locality is given.

AQUILEGIA CANADENSIS, L. *Columbine.* Very common in rocky places. May. It is sometimes found with white flowers.

ACTÆA SPICATA, L., var. RUBRA, Michx. *Red Baneberry.* Not very common; rocky hillsides; last of June.

A. ALBA, Bigel. *White Baneberry.* More common than the preceding; occurs in the same localities.

CIMICIFUGA RACEMOSA, Ell. *Black Snakeroot.* Rare; rocky woods and on mountains; July.

Order—MAGNOLIACEÆ.

LIRIODENDRON TULIPIFERA, L. *Tulip Tree. White Wood.* Rare; found only in Bennington County, Valley of the Hoosac river by Mrs. Carr, and on the South side of Mt. Anthony in Pownal by C. C. Frost, but Thompson says, in the appendix to his History of Vermont, that, "formerly it was not rare in the southern part of the State."

Order—MENISPERMACEÆ.

MENISPERMUM CANADENSE, L. *Moon-seed.* Common, especially in the northern part of the state. June.

Order—BERBERIDACEÆ.

CAULOPHYLLUM THALICTROIDES, Michx. Leontice thalictroides, L. *Pappoose Root.* Common on rocky hillsides; June.

PODOPHYLLUM PELTATUM, L. *May Apple. Mandrake.* Not common; May.

Order—NYMPHÆACEÆ.

BRASENIA PELTATA, Pursh. *Water Shield.* Ponds. July.

NYMPHÆA ODORATA, L. *Pond Lily.* Common in still water; July.

NUPHAR ADVENA, Ait. *Yellow Pond Lily.* Ponds, common; June.

N. KALMIANA, Pursh. N. lutea, var. Kalmiana, T. and G. *Yellow Lily.* Interval lands, in pools; Burlington; Torrey; July.

Order—SARRACENIACEÆ.

SARRACENIA PURPUREA, L. *Pitcher Plant. Side-Saddle Flower.* Very common in bogs; July.

Order—PAPAVERACEÆ.

*CHELIDONIUM MAJUS, L. *Celandine.* Common about dwellings along roadsides; June.

SANGUINARIA CANADENSIS, L. *Blood-root.* Common, especially in the northern part of the State; May.

Order—FUMARIACEÆ.

ADLUMIA CIRRHOSA, Raf. *Mountain Fringe.* Not very common; July.

DICENTRA CUCULLARIA, DC. *Dutchman's Breeches.* Quite common in damp woods; May.

D. CANADENSIS, DC. *Squirrel Corn.* Not so common as the preceding; May.

CORYDALIS GLAUCA, Pursh. *Corydalis.* Not common; grows in dry rocky places; June.

C. AUREA, Willd. *Golden Corydalis.* More common than C. glauca; rocky woods; June.

(*Continued in the next number.*)

Botanical Notes, Containing a Description of a New Trillium. By Edward T. Nelson, Ph. D., Professor of Zoölogy, Geology, and Botany, in the Ohio Wesleyan University.

No doubt every collector's experience is much the same as my own. Every season he will notice variations in plants not recorded in botanical works, peculiarities in growth, color, or size, small things in themselves yet of interest to all who are likewise engaged. There is a *brotherhood* in *science* and thus the private property of each soon becomes the public property of all. During the Summer of 1871 I noticed a few points of interest connected with Indiana flowers, and some of the more interesting I shall mention in this article.

MISTLETOE. (*Phorodendron flavescens.*) This parasitic plant being rather abundant I took occasion during the Summer to note, first: On what trees is it found?, second: Does it seem to injure them? I find that the habits of this plant vary in different places in regard to the trees upon which it makes its home. In southern Indiana, as far as my observations go, it is never found on the Oaks, while in other parts of the State and the West it is chiefly found on the Oak. It would be of interest to determine whether there is any difference in the plants growing in different localities. I observed hundreds if not thousands of trees, with special reference to the question and did not find a single Oak covered by the parasite although the oaks were well represented in the forest. In a contracted area where the trees could be easily counted I found that out of one hundred and twenty trees burdened with the Mistletoe one hundred and nine were Elms, mostly the *Ulmus Americana*, but now and then the *Ulmus fulva*, nine were the common Sweet Locust (*Gleditschia triacanthus*), one was the common Locust (*Robinia pseudacacia;*) and one the Walnut (*Juglans nigra*). This proportion is not far from correct for the whole forest I should judge.

As to the second question: "Does the Mistletoe injure the trees upon which it grows." The general impression, among those who have observed the growth of the parasite, is that it does not injure forest trees in the least. I think however this is an erroneous view. Forest trees have a vast amount of vitality, nor are we able to judge of the latent strength of a tree. For three reasons trees do seem to withstand the attacks of the Mistletoe, and even grow luxuriantly when every branch has one of these parasites clinging to it. But I have had the good fortune to observe a few trees almost completely covered by this plant. In every such case the leaves of the tree were few in number and very small as compared with those of other trees. The topmost branches were either dead or nearly so, while the whole tree seemed to have lost its strength. I have also noticed some dead trees covered with Mistletoe but can not say positively that this was the sole cause of its death. In the trees now completely covered by the Mistletoe it appears as if the leaves of the plant were taking the place, at least partially, of the leaves of the trees, thus indicating that the sap is being thus exposed to the carbonic acid of the atmosphere. There are many points connected with the growth of this parasite which are unknown as yet.

VARIATION IN TRILLIUM SESSILE.—The Trillium is one of the most variable of flowers, and owing to the large size of the plants, the nature of the variation can easily be detected. In many cases the cause of the variation can also be detected. During the past summer the *Trillium sessile* was very abundant and also very variable. I estimate that not less than two per cent of the specimens were either in "fours" or "fives." I was early led to suspect that these so-called monstrosities were caused by the coalescence of two embryos. And if this be true it very satisfactorily accounts for such abnormal forms as are now and then met with where the union of the parts is so complete that we fail to discover the coalescence. A very beautiful specimen of the species just mentioned was found with all the parts in "fives." Of the leaves there was one which was double the thickness of either of the others. This was so evident that it could be detected by the touch as well as by the eye. On drying this thickened leaf partially separated into two leaves of the ordinary form and thickness. The corresponding petals and sepals were also thickened but hardly as much so as the leaf, nor did they show any signs of separation on drying. The stamen which corresponded in position was only slightly if any larger than the others, but this follows the well-known law that the essential organs vary less than the floral coverings.

A cross-section of the stem also presented evidence to prove the plant a double one. The stronger and larger stem was concave on one side and into this concavity the other stem fitted, the whole being covered by the dermal and epidermal coats. All the specimens in "fours" presented two of each set of organs thickened, some of them very decidedly so. Such union of embryos (if this view be correct) must be much more common in the vegetable than in the animal kingdom. It would be of interest to science to determine what proportion of the abnormal forms of plants is due to such coalescence of embryos and what proportion is to be still considered "sports of nature."

ARISÆMA TRIPHYLLUM. (*Indian Turnip.*)—A monstrous form of this species is worthy of note. Gray calls it a "low plant" and such it usually is, but plants two feet to two and a half feet high were very common. One specimen measured three feet and nine inches in hight, with scape five inches in circumference, and spadix as large, and much resembling an ear of corn. No specimens at this locality were as small as given by Wood (8′–12′) or Darby (10′–12′). Yet I could find no differences worthy of note, except size, between this form and the described species.

ALBINOS are to be expected occasionally in many species, so that recording them seems hardly necessary, yet I will mention a few which came under my notice the past Summer. *Viola cucullata:* on one hillside a pure white variety had taken the place of the more common "blue" variety. The centre of the flower was of a delicate lemon-yellow, lateral petals strongly bearded, leaves penciled with purple, otherwise as the *viola cucullata.* *Houstonia cærulea:* white specimens of this species were also common. *Delphinium tricorne* was occasionally found with white flowers and this variety always had a many-flowered raceme. I think the flowers were one half as numerous again as the ordinary form. *Trifolium pratense:* white heads were common everywhere. *Phlox divaricata* was now and then found with white flowers, also the variety of Wood, *Phlox Laphamii*, which, by the way, does not seem to be a very constant variety, as I have noted the same plant bearing flowers with entire petals, and flowers with the "notched" petals. All possible gradations between the two forms were to be met with.

A NEW TRILLIUM.—During the past season a very interesting variety of the *Trillium* was found near Hanover Indiana, which is deserving of notice. The *Trillium* is one of our most variable genera, as I have already attempted to show, but the present form differs so notably from all described species that it must rank as a new one if the characters are constant. Not less than a dozen specimens were seen all agreeing in characters.

The plant was from one to two feet high. The leaves sessile or nearly so, rhombic ovate in shape, abruptly acuminate and tapering. The peduncle which was large even for this genus was nearly as long as the flower, and deflexed beneath the leaves. The petals were colored a rich dark purple, were ovate and pointed, much longer and more than twice as broad as the sepals. On all the specimens which I saw the sepals were slightly bordered with purple, and were rather more lanceolate than the petals, styles separate, stigmas strongly reflexed and as long as the stamens.

While this species has not quite the beauty of the pure *Trillium grandiflorum* it is among the most interesting species of this genus. If it has not already a name let it be called the *Trillium Indianum*, in honor of the State where first found. I would not forget to give the credit for first finding the species to Mr. A. Young, of Madison Indiana, to whom I was indebted for many favors during the past season.

Catalogue of, and Observations on the Birds of Vermont. By Rev. Daniel Goodhue, Londonderry, Vermont.

(Continued from page 105.)

PANDION CAROLINENSIS, Bonap.

Fish Hawk.

The Fish-hawk is a native of the southern States. It is noted for its industry, and is a friend to the agriculturist. Its food is animal, but robs none of its feathered tribe of their young, and seldom, if ever, known to injure them, and is such a friend to them that the Grakles, or Crow Blackbirds build their nests among the interstices of the sticks of which its own nest is constructed, both families living in perfect friendship. It is an enemy of the White-headed, or Bald Eagle who robs it of its food, and when joined with others, drives it from its fishing ground. Its nest is of enormous size, built of sticks, stalks of corn, sea weed and grasses, from four to five feet deep to two and three feet in breadth. This bird visits Vermont in the Spring, spending the Summer catching fish, and exhibits great skill upon the wing while sporting. Dr. Currier informs me that this bird is very abundant around Lake Memphremagog, where it is exceedingly fond of living and breeding.

BUTEO LINEATUS, Jardine.
Red-shouldered Hawk.

This bird is a native of Vermont, and is sometimes called the Red Hen Hawk. It builds its nest about the size of that of the Crow, on the top of a very tall tree, and is seldom seen from the woods. It lives principally on animal food, such as squirrels, mice, small birds, and occasionally poultry.

ACCIPITER COOPERII, Bonap.
Cooper's Hawk.

This is a very common bird in Vermont, called the Hen Hawk from the fact of its catching our hens and chickens near the buildings. Its nest resembles that of the Red-shouldered Hawk, and is built in the top of a very tall tree. It lays usually but two eggs, and are quite large in size in proportion to the bird. It is usually looked upon as an enemy rather than a friend to the agriculurist, though this is doubted, in consideration of the mice, squirrels and other animals destructive to vegetation, which it kills for food.

BUTEO PENNSYLVANICUS, Bonap.

Broad-winged Hawk.

This Hawk is a native of our State. Its nest resembles that of the preceding species, and lays from four to five eggs. This bird is rather rare, and when seen is often sailing very high in the atmosphere without any perceptible motion of the wings. At times it appears to remain perfectly motionless, but after a moment or two a slight motion of the wings may be perceived. After a short time it will be seen to move sometimes slowly and at others rapidly, through the air, with scarcely any motion of its wings. Frequently two may be seen in company.

ACCIPITER FUSCUS, Bonap.

Sharp-shinned Hawk.

This Hawk is a native of Vermont, and is more usually called the Chicken Hawk, taking its name from its habit of catching chickens. It is also called Pigeon Hawk. It is not with us a very rare bird. It may often be seen in the Summer carrying off a small chicken or sparrow.

FALCO ANATUM, Bonap.

Great-footed Hawk.

This rare bird is known to visit all the northern States. It is called the Duck Hawk from the fact of its seeking the duck beside the lakes and rivers, as one of its favorite luxuries. Its strength is very great, especially in its feet or claws. It is a common terror to other birds. It is nearly identical with the European species.

ASTUR ATRICAPILLUS, Bonap.

Goshawk.

This bird is known only in the northern parts of the State. It is distinguished for its brutish disposition. It has been known to devour its own young, hence is called a *cannibal.*

CIRCUS HUDSONIUS, Vieill.

Marsh Hawk.

This Hawk resembles very nearly the so called Hen Hawk, in its manner of living and capturing its food. It is found in low, wet, marshy swamps, more than other Hawks, and no doubt but for this reason it takes its name. It is highly valued in the southern States as a protector of the rice fields from rice birds.

BUTEO BOREALIS, Vieill.

Red-tailed Hawk.

This species is a native of our State. It is shy and much like other Hawks in its mode of living. Its nest resembles that of the Crow.

HYPOTRIORCHIS COLUMBARIUS, Gray.

Pigeon Hawk.

This bird takes its name from its habit of seeking the Pigeon for its food. It also preys upon our Robin and other small birds. It is not supposed to be a native of Vermont.

CARPODACUS PURPUREUS, Gray.

Purple Finch.

This bird has become quite common throughout this State, it is no unusual thing to see one or two pairs about a dwelling in a season.

BIBLIOGRAPHICAL NOTICES.

The Birds of New England and adjacent States. Containing descriptions of the birds of New England and adjacent States and provinces, arranged by a long-approved classification and nomenclature; together with a history of their habits, time of arrival and departure, their distribution, food, song, time of breeding, and a careful and accurate description of their nests and eggs; with illustrations of many species of the birds, and accurate figures of their eggs. By Edward A. Samuels, Curator of Zoology in the Massachusetts State Cabinet. Fifth edition, revised and enlarged. pp. 591. Noyes, Holmes & Co. Boston, Mass.

This volume has been prepared with a view of furnishing to all a work devoid of technicalities, and of a moderate price. The student in ornithology has here a very convenient manual to aid him. Synonyms, description, and accounts of the habits, of each species are given in a short yet sufficient space. The plates and wood-cuts are as good and numerous as can be afforded for the price of the work. The typographical work is good, but the binder has been unusually lavish with his ornamentations.

Third Annual Report on the Noxious, Beneficial and Other Insects of the State of Missouri. Made to the State Board of Agriculture. pursuant to an appropriation for this purpose from the Legislature of the State. By Chas. V. Riley, State Entomologist. pp. 176. 76 illustrations. From *Missouri State Times.*

Much has been done by Mr. Riley in disseminating a practical knowledge of entomology. The work before us is replete with new and useful facts brought out by him, during the previous year. Agriculturists and horticulturists have, in these reports information specially adapted to their interests.

First Annual Report of the Board of Commissioners of the Department of Public Parks, for the Year ending May 1 1871. pp. 427.

Numerous plates, maps, wood-cuts and photographs illustrate this work. An account of what has been done the previous year and of what is intended to be done in future on Central Park we are informed. A list of the animals in the menagerie is also added.

Circular, No. 3. A Report of the Surgical Cases treated in the Army of the United States from 1865 to 1871. pp. 296. Government Printing Office.

Mines, Mills, and Furnaces of the Pacific States and Territories. An account of the condition, resources, and methods of the mining and metallurgical industry in those regions, chiefly relating to the precious metals. By Rossiter W. Raymond, Ph. D. J. B. Ford & Co. New York.

This is a report of the condition of the mines and mining operations west of the Rocky Mountains, for 1870. Several plates and cuts illustrating the machinery used are added.

The Anatomy and Histology of the Human Eye. By A. Metz, M. D., Professor of Ophthalmology in Charity Hospital Medical College, Cleveland, Ohio. pp. 184. Published at the Office of the *Medical and Surgical Reporter.* Philadelphia.

We give only the contents of this work:—Anatomical description of the eye; visual apparatus—the eyeball; fibrous tunic; choroid; corpus ciliare; musculus ciliaris; iris; retina; crystalline lens; corpus vitreum; aqueous humor; orbit; muscles of the eye; actions of muscles of the eye; optic nerve; arteries; veins; nerves; eyelids; conjunctiva; lacrymal gland. This work was prepared as a text book on the eye for which it is admirably adapted.

A Treatise on Diseases of the Nervous System. By William A. Hammond, M. D., Professor of Diseases of the Mind and Nervous System and Clinical Medicine in the Bellevue Hospital Medical College, &c. pp. 754. 45 illustrations. D. Appleton & Co. 549 & 551 Broadway, New York.

This work treats of:—Cerebral congestion; cerebral anæmia; cerebral hæmorrhage; meningeal hæmorrhage; partial cerebral anæmia from obliteration of cerebral arteries; cerebral softening; aphasia; acute cerebral meningitis; tubercular cerbral meningitis; supurative encephalitis or cerebretis; diffused cerebral sclerosis; multiple cerebral sclerosis; tumors of the brain; insanity; spinal congestion; spinal anæmia; spinal hæmorrhage; spinal meningitis; acute myelitis; spinal softening; sclerosis of the antero-lateral columns of the spinal cord; sclerosis of the posterior columns of the spinal cord; tumors of the spinal cord; secondary degenerations of the spinal cord; tetanus; hydrophobia; epilepsy; catalepsy; ecstacy; chorea; hysteria; multiple cerebro-spinal sclerosis; athetosis; progressive muscular atrophy; glosso-labio-laryngeal paralysis; organic infantile paralysis; paralysis agitans; lead paralysis; peripheral paralysis; peripheral spasm; peripheral anæsthesia; and peripheral hyperæsthesia..

Cancer, its Classification and Remedies. By J. W. Bright, M. D. pp. 191. Published by S. W. Butler, M. D. Philadelphia, Pa.

The author brings forward the views of various authors upon his subject, expresses his own views in relation to the pathology and treatment, and reports a large number of cases to substantiate his particular mode. Several kindred subjects are also touched upon.

Hand-Book of Skin Diseases. By Dr. Isidor Neumann, Docent an der K. K. Universitat in Wien. Translated from the second German edition, with Notes, by Lucius D. Bulkley, A. M., M. D., Surgeon to the New York Dispensary, Department of Venereal Diseases and Skin Diseases etc. etc. pp. 467. 66 Wood-cuts. Published by D. Appleton & Co. 549 & 551 Broadway, New York.

The diseases treated in this work are divided into nine classes: 1, anomalies of secretion; 2, inflamation; 3, haemorrhages; 4, hypertrophies; 5, atrophies; 6, new formations; 7, pigmentary anomelies; 8, neuroses; 9, parasitic diseases. One might infer from the title of this book that it is merely a practical work for a busy practitioner, giving attention mostly to diagnosis and treatment, but it is more than that, the pathological anatomy receives much more attention than any other work published in this country. It is carried quite in advance of the general profession, and will be found a reliable authority.

Anæsthesia, Hospitalism, Hermaphroditsm, and a Proposal to Stamp out Small-pox and other Contagious Diseases. By Sir James Y. Simpson, Bart., M. D., D. C. L., Late Professor of Midwifery in the University of Edinburgh. Edited by Sir W. G. Simpson Bart., B. A., Scholar of Gonville and Caius College. Cambridge. Published by D. Appleton & Co. 549 & 551, Broadway, New York.

The article on anæsthesia is a collection of the papers written by Prof. Simpson from the time of the discovery of anæsthesia and its employment in surgery, up to 1870, the date of the last paper. They relate to the history, defence, application and authenticity of the discovery of anæsthesia and anæsthetic agents; The subject of Hospitalism shows the advantage of private practice over hospital in amputations, also the increased mortality in all diseases, in hospitals, and how our hospitals could be made more salubrious.

Neuralgia and the Diseases that Resemble it By Francis E. Anstie, M. D. (London.) Fellow of the Royal College of Physicians, &c, &c. Published by D. Appleton & Co. 449 & 551 Broadway, New York.

This work of 362 pages, treats exhaustively of the clinical history, complications, pathology, etiology, diagnosis, prognosis and treatment of neuralgia. The diseases that resemble it, and are mentioned, are: spinal irritation; pains of hypochondriasis; locomotor ataxy; cerebral abscess; alcoholism; subacute and chronic rheumatism; latent gout; cholic; pains of peripheral irritation; and dyspeptic headache. The work is very systematically arranged, and neatly gotten up.

Modern Medical Therapeutics. A Compendium of Recent Formulae, and Specific Therapeutical Directions. By Geo. H. Napheys, A. M., M. D. Third Edition, revised and improved. Published by S. W. Butler, M. D. 115 South Seventh Street, Philadelphia.

This edition is much larger than the previous one. Dr. Napheys has taken great pains to collect into this volume, recent prescriptions of eminent physicians from the various parts of the world. Under each disease the appropriate prescriptions will be found. There are three indexes, one of remedies, another of diseases, and a third of authors.

A Grammar of the Greek Language. For the use of Schools and Colleges. By Alpheus Crosby, Professor Emeritus of the Greek Language and Literature in Dartmouth College. Revised Edition. From J W C. Gilman, General Agent for Introduction. 32 Broomfield Street, Boston.

This work has been long the standard authority in many of our schools and colleges. Several changes have been made in the typography of it which facilitates the labor of the student and adds much to the appearance of the book.

The Detection of Criminal Abortion, and a Study of Fœticidal Drugs. By Ely Van De Warker, M. D. Published by James Campbell, 18 Tremont Street, Boston.

The Physician's Annual for 1872. A Complete Calender for the City and Country Practitioner. Published by S. W. Butler, M. D. Philadelphia.

The Physician's Daily Pocket Record. Comprising a Visiting List, many useful memoranda, tables, etc. By S. W. Butler, M. D., Publishler, Philadelphia.

The Physician's Diary. Containing a Visiting List, Diary and Daily Memoranda, Obstetric and Vaccination Records, etc. Published by Tilden & Co. New Lebanon, N. Y.

TRANSACTIONS
OF THE
ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

JANUARY 11, 1871.

Regular Meeting at West Charleston.

President HINMAN in the chair

Peat Bog.—Rev. S. R. Hall read a paper on the peat deposits in Orleans County, in which he showed their usefulness as fertilizers. Many of them were underlaid by extensive beds of shell marl, others by a stratum of clay or gravel. In some places these deposits were found to be more than one hundred feet deep, but usually the average was from seven to ten feet. Manganese was a constant ingredient in most of the beds, which, however, he considered disadvantageous as a manure. He found phosphate of lime in very small quantities in nearly evey locality In Brownington he dug out numerous billets of beaver-knawed wood, six inches in diameter, and seven feet below the surface of the bog. These billets were of a different species from any found in that region or even in Vermont anywhere at the present time.

Donations to Museum.—Two specimens of serpentine and one of copper ore from the Huntington Mine, Quebec, Canada, *from E. Harrington;* 3 undetermined crysalids, *from J. C. Kennedy*

Excursions.—J. M Currier made some obervations on the entomology of Vermont, stating that but a little had been done in that branch of science in this State, suggested that during the coming Summer several excursions be made for the purpose of collecting specimens and stuying species. The Society voted so to do.

MARCH 14, 1871

Regular Meeting at Derby

President HINMAN in the chair

Donations to Museum.—Several specimens of limestone from Owl's Head, showing fossil shells and corals, so changed by heat subsequent to their deposition as to nearly obliterate their true features, while others in the same rock had been but little effected by that agency; 1 conglomerate boulder from Newport, the pebbles of which seemed to have been sharp and angular at the time of formation and were rounded off by the injection of lava: *from J. M. Currier;* 4 entomological specimens, *from J. C. Kennedy;* 1 specimen of clay-slate from Westfield and claimed to be superior to any other quarry in this country for slate pencils, *from D. Goodhue,* 1 boulder of hornblende in calciferous micaschist from Holland, the former was in beautiful large feathery crystals which stood out in relief on the surface from the weathering out of the latter; the stone was broken up and the largest part deposited in the State Cabinet; *from Joseph Bates.*

ARCHIVES OF SCIENCE.

VOL. I. JAN. & APR., 1873. NO. VI.

Catalogue of the Flowering Plants of Vermont. By George H. Perkins, Ph. D., Professor of Zoölogy, Geology and Botany, in the University of Vermont. Burlington.

(Continued from page 166.*)*

Order—CRUCIFERÆ.

NASTURTIUM PALUSTRE, DC. *Marsh Cress.* Wet meadows, bogs and borders of brooks; July.

N. PALUSTRE, var. HISPIDUM. N. hispidum, DC. Borders of ponds.

N. LACUSTRE, Gray. *Lake Cress.* Amoracia Americana, Arn. N. NATANS, var. AMERICANUM, Gray. In shallow water on the borders of Otter Creek near Vergennes where it is abundant for several miles; Robbins, Torrey, Frost; July.

N. *ARMORACIA, Fries. Armoracia rusticana, Rupp. *Horseradish.* Common about old gardens and near dwellings where it has escaped from cultivation; June.

DENTARIA DIPHYLLA, L. *Pepper-root.* River banks; rare; last of May.

D. MAXIMA, Nutt. The only specimens of this rare species that have come under my observation are a half dozen that I discovered in a ravine near Burlington; June.

D. LACINIATA, Muhl. Woods and interval meadows; rather common; May.

CARDAMINE RHOMBOIDEA, DC. *Bitter Cress.* Moist ground; not common; May.

C. ROTUNDIFOLIA, Michx. *Water Cress.* Reported as found in Vermont by Dr. Robbins.

C. PRATENSIS, L. *Cuckoo-Flower.* Occurs chiefly in the northern part of the state; May.

C. HIRSUTA, L. *Common Cress.* Common in wet places; last of May.

ARABIS LYRATA, L. Not common; May.

A. HIRSUTA, Scop. Not common; last of May.

A. LEVIGATA, DC. Not common; rocky ground; June.

A. CANADENSIS, L. *Sickle-pod.* Rocks near Winooski Falls, Colchester; Prof. J. Torrey; June.

A. PERFOLIATA, Lam. Rocky ground; June; C. C. Frost.

BARBAREA VULGARIS, R. Br. *Winter Cress.* Meadows; rather common; last of May.

ERYSIMUM CHEIRANTHOIDES, L. *False Wall-Flower.* Brattleborough; C. C. Frost.

SISYMBRIUM *OFFICINALE, Scop. Common along roadsides; June.

S. THALIANUM, Gaud. Arabis Thaliana, L. *Mouse-ear Cress.* Rocky and sandy places; A Wood.

Brassica *sinapistrum, Bois. Sinapis arvensis, L. *Field Mustard.* Not very common.

B. *nigra, Gray. Sinapis nigra, L. *Black Mustard.* Common about cultivated grounds; June.

Draba arabisans, Michx. Rare; shores and islands of Lake Champlain, and Willoughby Lake; Wood; May.

D. verna, L. *Whitlow-Grass.* Willoughby Lake; Wood.

Camelina *sativa, Crantz. *False Flax.* Old fields, and Meadows; common.

Capsella *Bursa-pastoris, Mœnch. *Shepherd's Purse.* Very common everywhere; May.

Lepidium Virginicum, L. *Pepper-grass.* Not very common; June.

L. ruderale, L. Dry ground; rare; near lake shore Burlington; June.

Raphanus raphanistrum, L. *Wild Radish.* Cultivated ground; June.

Isatis *tinctoria, L. "Banks and islands of Winooski river near Burlington;" Prof. Torrey.

CAPPARIDACEÆ.

Polanisia graveolens, Raf. Common along the shady shores of Lake Champlain; July.

VIOLACEÆ.

Viola rotundifolia, Michx. *Blue Violet.* Not common; woods; last of April.

V. blanda, L. *White Violet.* Very common in wet places; April.

V. Selkirkii, Goldie. Cedar swamps, Grand Isle, Valcour's Island, and other islands in Lake Champlain, also near the base of Montreal Mountain, P. Q. May.

V. CUCULLATA, Ait. *Common Blue Violet.* Very abundant in all moist places; April.

V. CUCULLATA, Ait. var. PALMATA, Gray. Woods; much less common; Pownal, Robbins; May.

V. SAGITTATA, Ait. *Blue Violet.* Rocky woods; not uncommon; May.

V. PEDATA, Linn. *Bird-foot Violet.* Brattleborough; C. C. Frost.

V. ROSTRATA, Pursh. Not very common; last of May.

V. STRIATA, Ait. *Striped Violet.* Very abundant on moist hillsides; June to middle of October.

V. MUHLENBERGII, Torrey. *Dog Violet.* Common; May.

V. CANADENSIS, L. *Canada Violet.* Common in woods; May.

V. PUBESCENS, Ait. *Yellow Violet.* Common in woods; May.

CISTACEÆ.

HELIANTHEMUM CANADENSE, Michx. *Frost-weed.* Rocky soil; not very common; June.

LECHEA MAJOR, Michx. *Pinweed.* Dry soil, common; July.

L. MINOR, Lam. *Pinweed.* Dry soil; July.

DROSERACEÆ.

DROSERA ROTUNDIFOLIA, L. *Dew Plant. Sundew.* Common in swamps and on moist banks; June.

D. LONGIFOLIA, L. *Sundew.* Common in swamps; June.

PARNASSIACEÆ.

PARNASSIA CAROLINIANA, Michx. Banks of Winooski River near Burlington; July; not common.

HYPERICACEÆ.

HYPERICUM CANADENSE, L. *St. John's-wort.* Not very common; moist ground; June.

H. CORYMBOSUM, Muhl. Common; July.

H. ELLIPTICUM, Hook. Meadows and moist ground; July.

H. MUTILUM, L. Moist places; common; July.

H. PYRAMIDATUM, Ait. *Great St. John's-wort.* Not very common; wet ground; July.

H. SAROTHRA, Michx. *Pine-weed.* Brattleborough; C. C. Frost; July.

H. *PERFORATUM, L. *Common St. John's-wort.* Abundant in pastures; June.

ELODEA VIRGINICA, Nutt. Moist ground; common; July.

CARYOPHYLLACEÆ.

DIANTHUS *ARMERIA, L. *Pink.* Fields and grassy places; Mrs. Brown.

SAPONARIA *OFFICINALIS, L. *Bouncing bet.* Common about door yards; June.

SILENE INFLATA, Smith. Fields; June.

S. ANTIRRHINA, L. *Snap-dragon.* Dry and rocky ground; June.

S. *NOCTIFLORA, L. *Catchfly.* Dry ground; July.

LYCHNIS *GITHAGO, Lam. Agrostemma Githago, L. *Corn-Cockle.* Not very common; cultivated fields; June.

ARENARIA *SERPYLLIFOLIA, L. *Sandwort.* Sandy soil; May.

A. STRICTA, Michx. Alsine stricta. Alsine Michauxii, Fenzl. Common on rocks; June.

A. GRŒNLANDICA, Spreng. Alsine Grœnlandica, Fenzl. Common on Mt. Mansfield and Camel's Hump; June, July.

A. LATERIFLORA, L. Nochringia lateriflora, L. Damp woods and banks; June.

STELLARIA *MEDIA, Smith. *Chickweed.* Very common in gardens; May.

S. LONGIFOLIA, Muhl. *Stitchwort.* Abundant among grass in damp places; June.

S. BOREALIS, Bigel. Damp places and on mountains; June.

CERASTIUM *VULGATUM, L. *Mouse-ear Chickweed.* Common on hillsides; June.

C. NUTANS, Raf. Moist places in the shade; May.

ANYCHIA DICHOTOMA, Michx. Paronychia Canadensis, Wood. Rocks, Burlington; not common; June.

SAGINA PROCUMBENS, L. Brattleborough; Frost; June.

MOLLUGO VERTICILLATA, L. *Carpet-weed.* Common in sandy soil; July.

PORTULACACEÆ.

PORTULACA *OLERACEA, L. *Purslane.* Very common about cultivated ground; July.

CLAYTONIA VIRGINICA, L. *Spring Beauty.* Common in meadows and damp woods; June.

C. CAROLINIANA, Michx. *Spring Beauty.* Common; April.

MALVACEÆ.

MALVA *ROTUNDIFOLIA, L. *Mallows.* Common; June.

M. *SYLVESTRIS, L. *Tall Mallow.* Waysides; Brattleborough; C. C. Frost.

ABUTILON *AVICENNÆ, Gærtn. *Velvet-Leaf.* Waste grounds and roadsides; Aug.

TILIACEÆ.

TILIA AMERICANA, L. *Linden. Basswood.* Woods and river banks; July.

LINACEÆ.

LINUM VIRGINIANUM, L. *Wild Flax.* Dry Woods; Pownal, Robbins; June.

L. *USITATISSIMUM, L. *Common Flax.* Old fields where it has escaped from cultivation; July.

GERANIACEÆ.

GERANIUM MACULATUM, L. *Wild Geranium.* Not very common; open woods and fields; June.

G. CAROLINIANUM, L. *Cranesbill.* Rocks; not very common; June.

G. *DISSECTUM, L. G. Carolinianum, var. dissectum, Gray. "Hills near Castleton, Robbins;" June.

G. ROBERTIANUM, L. *Herb Robert.* Shaded rocks; not uncommon; June.

IMPATIENS PALLIDA, Nutt. *Balsam.* Moist banks; June

I. FULVA, Nutt. *Balsam. Touch-me-not.* Common in moist shaded places.

OXALIS ACETOSELLA, L. *Wood Sorrel.* Not uncommon; June. A large flowered variety occurs on Camel's Hump about half way from the base, and probably on other mountains.

O. STRICTA, L. *Yellow Sorrel. Lady Sorrel.* Common in fields, woods and pastures; June.

RUTACEÆ.

XANTHOXYLUM AMERICANUM, Muhl. *Prickly Ash.* Not common; April.

ANACARDIACEÆ.

RHUS TYPHINA, L. *Sumach.* Hillsides; common; June.

R. GLABRA, L. *Smooth Sumach.* Hills; July.

R. COPALLINA, L. *Small Sumach.* Hills; July.

R. VENENATA, DC. *Poison Sumach. Dogwood.* Swamps; July. This and the two preceding species occur only sparingly.

R. TOXICODENDRON, L. *Poison Ivy.* Very common, especially in dry ground; June.

R. AROMATICA, Ait. *Fragrant Sumach.* Dry soil; not very common; May.

VITACEÆ.

VITIS LABRUSCA, L. *Fox Grape.* Thickets; common; June.

V. ÆSTIVALIS, Michx. *Wild Grape.* Common along river banks; June.

V. RIPARIA, Michx. V. cordifolia, var. riparia, Gray. *Wild Grape.* Moist thickets.

V. CORDIFOLIA, Michx. *Frost Grape.* Very common; June.

AMPELOPSIS QUINQUEFOLIA, Michx. *Virginia Creeper.* Very common; July.

RHAMNACEÆ.

RHAMNUS CATHARTICUS, L. *Buckthorn.* Not very common; used for hedges; May.

R. ALNIFOLIUS, L'Her. Swamps; June.

CEANOTHUS AMERICANUS, L. *New Jersey Tea.* Rather common; June.

C. OVALIS, Bigel. Common on sandy banks along Lake Champlain; June.

CELASTRACEÆ.

Celastrus scandens, L. *Bitter-sweet.* River banks, shores of Lake Champlain, etc. ; June.

Euonymus atropurpureus, Jacq. *Burning-Bush.* This is common in cultivation and as it occurs native in Canada and New York it is not very unlikely that it may yet be found growing wild in Vermont.

SAPINDACEÆ.

Staphylea trifolia, L. *Bladder-nut.* Not common ; rocky hills ; May.

Æsculus *hippocastanum, L. *Horse-chestnut.* Common as a cultivated tree ; May.

Acer Pennsylvanicum, L. A. striatum, Lam. *Striped Maple.* Quite common especially on hillsides ; last of May.

A. spicatum, Lam. *Mountain Maple.* Common on rocky hills ; last of May.

A. saccharinum, L. *Sugar Maple. Rock Maple.* Common, especially in moist soil ; last of April. This species is far more abundant than either of those that follow. It often forms groves of considerable extent and, owing to the value of the products obtained from it, is more carefully protected than any other of our native trees.

A. saccharinum, var. nigrum, Gray. A. nigrum, Michx. *Black Maple.* Occurs with the last but is not common.

A. dasycarpum, Ehrh. *White Maple.* River banks and moist ground ; April.

A. rubrum, L. *Red Maple. Soft Maple.* Swamps and moist woods ; common ; April.

Negundo aceroides, Mœnch. Acer negundo, L. *Ash-leaved Maple.* Not common ; river banks and meadows ; May.

POLYGALACEÆ.

POLYGALA PAUCIFOLIA, L. *Milkwort.* Very abundant in open woods; May.

P. POLYGAMA, Walt. Very common in dry and shady places; July.

P. SANGUINEA, L. Sandy and moist places; C. C. Frost.

P. SENEGA, L. *Seneca Snake-root.* Common in dry soil; June.

P. VERTICILLATA, L. Near Bellows Falls; July.

P. VERTICILLATA, var. AMBIGUA. P. ambigua, Nutt. Dry fields and woods; not common.

Notes on Nostochineæ. By Hiram A. Cutting, A. M., M. D., State Geologist, and Curator of the State Cabinet, Lunenburgh, Vermont.

On the 14th of September 1872, while looking for dendrites on the schist rock in Newbury, in company with Dr. J. M. Currier, we found the little pools of water on the side of the railroad closely filled with algæ, which, upon examination, proved to be Nostochineæ. They were round bodies resembling grapes, in the main, though many were joined in shapeless masses. They were from the size of a pin head to one inch or more in diameter. In color they were all shades of green.

The phycoma or general mass of the plant was enclosed by a pellicle or skin-like envelope, determinate, globose, but of various forms, gelatinous, soft, elastic, containing, as shown under the microscope, simple curved and entangled moniliform colorless or greenish filaments, composed of cells which appeared solid, but transparent, imbedded in a continuous, amorphous, gelatinous matrix. The cells seemed of two sizes, with eight smaller and one larger, or perhaps spermatic cells, that appeared brighter than the rest. On the outside of the envelope, and firmly adhering thereto, were small spores that were nearly black resembling the seeds upon a strawberry.

This Nostoc is a typical genus of the Nostochineæ, distinguished from the allied genera by the definitely formed pellicle that encloses the fronds Thuret states, that the pellicle of the fronds bursts, allowing the gelatinous mass to escape, and the filaments to spread abroad in the water, thus reproducing. Vancher says, after bursting they are endowed with the power of moving slowly along lengthwise, and that after a time the cells cease to move, and a new gelatinous pulp with an envelope is formed around each piece. My observations do not accord with theirs, as I can find no reproduction in that way. Yet it may be that under other circumstances their manner of reproduction might change. I noticed that at the point of adhesion of a spore a few cells would ooze out from the gelatinous mass, among which would be one or two of the larger cells, and a new nostoc would grow adhering to the mass for a short time, or perhaps a few days, when it would usually split off from the parent and take up a separate existance. Many times however they would adhere to each other in their growth so that as many as ten or twelve would sometimes be attached, thus forming shapeless lobed masses.

The near alliance of this alga to the Colloma, has attracted much attention, and some authors even assert that it is only a variety of the same species. The memoir of Sachs on the subject is deserving of attention. Many species of this alga are found growing in water, sometimes in brackish water, or even in hot springs. Others grow on the naked soil or rocks even. The color is usually green, sometimes bluish. The species (*N. edule*) found in the streams of China is used as an article of food. It is dried and then added as wanted to soups, for which its gelatinous substances, rich in bassorin, renders it peculiarly appropriate.

Another closely allied alga abounds in the Arctic regions, affording much wholesome food. Several species are indigenous to the United States but seem rare in this section. In Texas that peculiar species (*N. flagelliforme*) which grows on the naked soil, having long forked fronds, and known as "Falling-stars," is common. No one at first would take this as a nostoc, but its structure is precisely the same. In fine nostocs grow in all parts of the world, and are capable of bearing great extremes of both heat and cold. They are known not only under their proper name but as "Star-jelly" or "Witches'-butter" on account of their gelatinous texture. As they form charming and various objects for the microscope, they are deserving of special attention.

Catalogue of the Cryptogamous or Flowerless Plants of Vermont. By Chas. C. Frost, Brattleborough, Vermont.

(Continued from page 153.*)*

MUSCI.—MOSSES.

HYPNUM FILICINUM, L. Wet places

H. CRISTA-CASTRENSIS, L. On the ground in mountainous districts.

H. MOLLUSCUM, Hedw. Rocks and ground in moist places.

H. CUPRESSIFORME, L. Rocks and ground in shady places.

H. IMPONENS, Hedw. On the ground and decaying logs.

H. REPTILE, Michx. Base of trees.

H. CURVIFOLIUM, Hedw. On earth and decaying logs.

H. HALDANIANUM, Grev. On earth and decaying logs.

H. PRATENSE, Koch. Wet rocks and grounds.

H. RUGOSUM, Ehrh. On limestone rocks.

H. VELUTINUM, Dill. Sandy banks in woods.

H. SALEBROSUM, Hoffm. On ground and decaying logs.

H. LÆTUM, Brid. On ground and decaying logs.

H. PLUMOSUM, L. Rocks near streams.

H. RUTABULUM, L. Wet and springy places.

H. NOVÆ-ANGLIÆ, Sulliv. & Lesqx. Mountains.

H. STELLATUM, Schreb. Bogs and marshes.

H. POLYMORPHUM, Bryol. Europ. Moist clayey banks.

H. HISPIDULUM, Brid. Base of trees in dry places.

H. DIMORPHUM, Brid. Dry shaded rocks.

H. ADNATUM, Hedw. Base of trees and on stones.

H. SERPENS, Hedw. Rocks and decaying logs.

H. RADICALE, Brid. Rocks and decaying logs.

H. ORTHOCLADON, Beauv. Wet springy places.

H. RIPARIUM, Hedw. Swamps and on stones in rivulets.

H. LESCURII, Sulliv. Wet rocks.

H. DENTICULATUM, L. Swamps and moist rocks.

H. MUHLENBECKII, Bryol. Europ. On rocks and the ground.

H. SYLVATICUM, L. On rocks in mountains.

A. SULLIVANTIÆ, W. P. Sch. On rocks in dense woods.

HEPATICÆ.—LIVERWORTS.

RICCIA NATANS, L. Floating on stagnant water.

R. FLUITANS, L. Floating on stagnant water.

R. SULLIVANTII, Austin. Low grounds.

ANTHOCEROS PUNCTATUS, L. Wet slopes side of ditches.

A. LÆVIS, L. Wet slopes side of ditches.

MARCHANTIA POLYMORPHA, L. Shady moist places.

FEGATELLA CONICA, Corda. Springy places.

REBOULIA HEMISPHÆRICA, Raddi. Shady moist places.

FIMBRIARIA TENELLA, Nees. Shady places.

METZGERIA FURCATA, Nees. Rocks and bark of trees.

ANEURA PALMATA, Nees. Rotten logs.

A. MULTIFIDA, Dumort. Moist rocky banks.

PELLIA EPIPHYLLA, Nees. Moist shady places on earth.

GEOCALYX GRAVEOLENS, Nees. On the ground and on rotten logs.

CHILOSCYPHUS POLYANTHOS, Corda. Rocks.

LOPHOCOLEA BIDENTATA, Nees. On moist rocks.

SPHAGNŒCETIS COMMUNIS, Nees. Mosses and decaying wood.

JUNGERMANNIA TRICHOPHYLLA, L. Decaying wood, etc.

J. SETACEA, Weber. On earth.

J. CONNIVENS, Dickson. On rotten wood.

J. DIVARICATA, Engl. Bot. Mosses and decaying wood.

J. BARBATA, Schreber. On ground and rocks.

J. CURVIFOLIA, Dickson. Rotten logs.

J. SCHRADERI, Martius. Rotten logs.

J. INTERMEDIA, Lindenberg. On earth, etc.

J. CRENULATA, Smith. Margin of ditches.

J. EXSECTA, Schmidel. Boggy places.

SCAPANIA NEMOROSA, Nees. Moist banks.

PLAGIOCHILA SPINULOSA, Nees & Mont. Banks of rivulets.

P. ASPLENIOIDES, Nees & Mont. Banks of rivulets.

P. PORELLOIDES, Lindenberg. Base of trees in swamps.

SARCOSCYPHUS EHRHARTI, Corda. Rivulets.

FRULLANIA GRAYANA, Mont. On trees and rocks.

F. VIRGINICA, Lehm. Rocks and trees.

F. TAMARISCI, Nees. Rocks and trees.

F. EBORACENSIS, Lehm. Rocks and trees.

LEJEUNIA SERPYLLIFOLIA, Libert. On trees and moist rocks.

MADOTHECA PLATYPHYLLA, Dumort. Rocks and trees.

M. PORELLA, Nees. Inundated rocks.

RADULA COMPLANATA, Dumort. Base of trees, etc.

PTILIDIUM CILIARE, Nees. Rotten logs in woods.

TRICHOCOLEA TOMENTELLA, Nees. Moist places.

MASTIGOBRYUM TRILOBATUM, Nees. Damp ground, logs, etc.

LEPIDOZIA REPTANS, Nees. Hilly districts on the ground.

CALYPOGEIA TRICHOMANIS, Corda. Springy places.

METEOROLOGICAL OBSERVATIONS.

The Table upon the opposite page is a summary of observations made by Hiram A. Cutting, A. M., M. D., at Concord, and Lunenburgh, Vermont, for the past twenty-five years. The first six years, at Concord, at an elevation of 1526 feet, and the remaining nineteen at Lunenburgh, in *Lat.* 44° 28′, and *Lon.* 71° 41′, at an elevation of 1210 feet. The reduction has been made from observations taken each day at 7 A. M., and 2, and 9, P. M. Ten inches of snow has been allowed for one inch of water.

In 1851 it was very dry, and it will be noticed that the rain-fall was but little more than one half what it was for 1872, equally remarkable was it for excessive moisture. The range of the thermometer has been from 100° to −45°, by Fahrenheit scale, both extremes being in 1872. The extreme heat of Summer here seldom exceeds 90°, and the extreme cold of Winter is seldom lower than −30°, and that only one or two mornings in a winter.

The average number of stormy days in a year for this period has been 120, and the average number of fair days 118, of cloudy days 127. From this it is reasonable to infer that our time is pretty equally divided into fair, cloudy, and stormy weather. In Summer we have an excess of fair weather while in Winter there is an excess of stormy weather.

Year.	Average monthly Temperature in degrees and hundredths.												Yearly means.	Rain & melted Snow.	Winters.	Snow in inches.
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
1848	19.50	17.00	30.40	41.30	50.00	67.65	70.30	69.25	58.50	44.50	26.00	20.40	42.90	41.00	-1849	71.00
1849	10.70	14.50	30.00	40.50	53.70	58.90	69.60	54.75	56.40	40.90	30.40	19.50	39.99	35.80	1849-50	84.00
1850	10.00	14.07	25.50	35.00	55.00	69.50	67.60	64.00	58.30	50.00	29.73	21.00	41.64	40.00	1850-51	52.00
1851	20.50	14.22	31.75	39.16	57.00	62.50	64.25	70.00	51.50	40.00	25.80	19.00	41.31	33.50	1851-52	48.00
1852	20.50	19.28	21.00	32.00	50.50	64.50	69.00	65.50	58.00	43.00	30.00	21.00	41.19	39.00	1852-53	86.00
1853	22.00	12.70	23.50	38.00	54.00	63.50	69.75	67.00	56.50	43.50	28.70	23.75	41.91	41.75	1853-54	100.00
1854	10.50	9.00	22.34	34.16	52.30	67.10	70.40	64.50	57.25	45.75	32.30	15.25	40.07	36.60	1854-55	70.00
1855	21.70	14.30	29.20	39.60	40.80	63.70	67.20	68.25	60.00	43.75	30.00	21.00	41.63	38.25	1855-56	83.00
1856	22.00	18.50	20.40	35.50	51.30	67.40	68.50	64.00	57.70	44.00	28.90	20.00	41.51	39.80	1856-57	79.00
1857	14.20	20.00	24.50	32.70	50.60	65.30	60.80	62.30	52.00	42.50	31.00	19.50	39.62	37.25	1857-58	69.00
1858	8.30	23.10	24.70	34.60	50.00	59.15	65.30	62.40	53.00	42.50	33.40	21.50	39.83	38.50	1858-59	78.00
1859	17.75	19.00	25.50	33.00	51.50	63.00	64.50	67.00	57.00	39.50	34.00	14.00	40.48	35.30	1859-60	58.00
1860	18.20	16.00	28.50	38.00	58.50	66.50	69.00	66.00	55.50	49.00	39.00	19.00	43.60	38.90	1860-61	99.00
1861	19.50	22.00	27.00	41.50	48.50	63.25	68.00	66.00	54.00	45.00	32.00	21.00	42.31	47.00	1861-62	147.00
1862	16.00	19.50	26.50	39.00	55.00	63.00	68.00	62.00	59.50	48.00	30.00	20.00	42.21	45.80	1862-63	101.00
1863	24.00	19.00	19.20	36.10	59.20	64.30	70.20	70.00	56.00	47.00	26.70	18.40	42.51	46.00	1863-64	51.00
1864	18.00	20.60	31.00	41.00	55.00	68.20	71.90	70.90	55.88	48.10	33.86	22.56	44.75	39.02	1864-65	87.00
1865	14.80	19.06	33.80	40.97	49.21	67.30	60.84	70.82	56.55	37.42	34.56	24.46	42.48	39.69	1865-66	41.00
1866	14.45	20.35	27.50	37.98	45.10	69.00	73.25	60.90	52.37	48.68	45.72	20.91	43.02	38.10	1866-67	73.00
1867	9.62	23.52	24.61	39.10	49.34	65.97	70.06	64.83	49.37	44.93	30.05	10.90	40.19	39.65	1867-68	68.00
1868	11.69	8.87	28.45	34.61	53.04	63.65	72.07	67.26	54.98	41.49	29.55	14.86	40.04	43.37	1868-69	114.00
1869	19.27	20.00	19.67	38.80	51.91	61.78	68.19	63.83	62.07	43.30	30.53	22.03	41.78	43.95	1869-70	100.00
1870	22.08	16.31	23.89	43.31	54.08	69.12	72.57	67.63	60.42	46.69	33.71	22.15	44.33	45.65	1870-71	55.00
1871	13.74	17.42	34.45	42.00	53.99	64.92	68.18	66.86	55.21	47.75	26.69	17.27	42.37	42.96	1871-72	95.00
1872	14.62	16.31	16.72	38.74	54.88	66.95	70.43	69.66	59.77	45.48	31.80	9.09	41.20	60.91	1872-	71.50
Mns	16.54	17.38	26.00	37.86	52.18	65.05	68.39	65.82	56.31	44.51	31.38	19.14	41.72	41.11		79.54

TRANSACTIONS
OF THE
ORLEANS COUNTY SOCIETY OF NATURAL SCIENCES.

MAY 23, 1871.

Excursion to West Newport.

Dr. HINMAN presiding.

Several specimens were collected during the forenoon and observations of the general features of the region around West Newport were made, but the weather being rather too cool the party repaired to the residence of Mr. Benj. Hoyt, who kindly furnished a dinner, and room to hold the exercises in.

Fish.—Mr. Hoit was an old fisherman on Lake Memphremagog, and stated that there were two species of Muscalonge Trout (*Salmo namaycush, Pennant*,) in the lake, one commonly called Black Longe, the other White or Silver Longe, the latter much the largest, the former was seldom taken above 20 inches in length. These two apparently distinct varieties are in all probability produced by the nature of the bottom of the lake where the fish are accustomed to stay. In the middle and northern portions the bottom is black mud from the decomposing beds of dark carboniferous limestone and slates that skirt the lake in those sections. The Longe remain most of the time on the bottom in deep water and must partake more or less of the colouring matter that impregnates the water in which they live.

Dr. Currier remarked, that the Brook Trout (*Salmo fontinalis, Mitchell.*) which were so plentiful in all our streams when the county was new, are becoming now quite scarce. The reasons given were two: 1, fishermen are more plenty and catch them out when large enough to bite a small hook: 2, the county having been cleared up the small streams during the droughts of summer, almost completely dry up and the fish are killed, excepting here and there a deep eddy is left where a sufficient number remain to propagate and keep up a representation of species. In winters too they are killed off by freezing which usually takes place to a greater depth than it would were the streams protected by woods. These Trout are caught occasionally in Lake Memphremagog weighing two and one half pounds.

Glaciers in Newport.—Dr. Currier read a communication on the glacial action in the town of Newport. Several moraines were pointed out: one that existed in the north part of the town directed its course to Lake Memphremagog, leaving immense boulders in its course. Another moraine ran northward through Newport Centre and uniting in Canada with a similar and larger one coming down the Missisquoi Valley. Ledges in this section are rounded off and slope northwardly. Many grooves are distinctly seen upon those surfaces, seven were counted within a short distance on one rock in the west part of the town, some being three fourths of an inch in depth and three inches wide. One half mile west of the village of Newport exists another moraine with immense boulders of granite, some of which show glacial scratches Its course is directed northward toward Lake Memphremagog.

Collections.—Numerous collections were made, but the only ones of any importance were some Indian implements from the Memphremagog Valley. One arrow head of light drab colored hornstone, two hoes or gouges made of trap rock, from West Derby, where numerous relics have been turned out by the plow. A few years ago W. G. Norris found an arrow head of copper, now in the Smithsonian Collections at Washington. From the fact that many of these hoes are found on these Plains we conclude that they were once cultivated by the Aborigines, and tradition substantiates this view. These hoes are usually from ten to sixteen inches long, two and one half inches wide, and about one inch thick, with a convexity lengthwise; their cutting ends are also convex while the opposite are more generally pointed but do not bear the marks of usage so plainly. A curious implement was presented to our society by Mr. Orville Robinson, who found it where the village of Newport now stands, it is about fourteen inches long, rounded, and presents several smooth faces lengthwise, with minute transverse striæ on the surface. This must have been used for grinding corn or other seeds by taking hold of the ends in the manner that the "rolling-pin" is used, but not allowed to roll in the hand. By its use on a flat stone fine flour or meal could be made after the pestle had done the crushing. One end of this utensil had been sharpened to an edge, which would bring us to conclude that these rude implements were used for more than one purpose, thus after a pestle or mill stone had become too much worn for grinding they were sharpened into chizels. Large pestles and grinders have been found just commenced to be worn on their convex surfaces, with blunt ends for pounding but without a cutting end for other uses. When such implements are sufficiently worn down they are then made into chizels.

Beaches on Lake Memphremagog.—Dr. Currier remarked that his attention had been called to the large accumulations of sand and pebbles on the western shores of Lake Memphremagog, in certain places where for several years past they had been removed every year for building purposes. The beach would be completely cleared of them every season but on returning for the same purpose the next year the supply was as abundant as the previous year.

The agencies concerned in the production of this phenomenon are three, viz: wind, water, and ice. In the Spring when the ice in the lake breaks up there is usually a prevailing north wind which drives the ice southward, when it arrives at the beach, being about three or four feet thick, pushes before it large quantities of the pebbles in question. Masses of ice which have been detached from northern shores often transport .sand, pebbles and small stones many miles. In the lake near Magoon's Point in Canada are several small islands, the rock formation of which is novaculite slate, small angular boulders of this formation have been transported by the ice to the southern shores, a distance of about ten miles. This shows the agency of ice.

The wind produces currants in the lake even at a great depth, which probably has the most influence in producing these accumulations. On looking into the water at a depth of ten feet or more, small sticks and grasses may be seen floating with considerable velocity, which shows that powerful currants in still water are in constant operation at great depths. These currants would be much accelerated during long continued winds, when pebbles and sand would be swept along before them.

JULY 11, 1870.

Excursion to Farrant's Grove, on the Western Shore of Lake Memphremagog.

Dr. HINMAN presiding.

Lunch.—Cicadæ.—After a jolly lunch in the grove at one o' clock Dr. Currier presented eighteen specimens of insects injurious to vegetation, gave a history of each and pointed out the nature of the damage done to the agriculturist by them. Four specimens of the 17–year Cicadæ were exhibited, they had been sent to the society from Iowa by Dr. Blanchard, several branches which the female had pierced for the deposit of her eggs, were also sent. Rev. T. E. Ranney remarked that when these cicadæ come forth in the Spring their numbers are so great that the forests resound with their music. He stated that when he resided in the Cherokee Nation it was necessary to tie a bell on his horse to enable him to find it when he wished, sometimes when within a very short distance of the horse he could not distinguish the sound of the bell so great was the noise of the Cicadæ. The Indans use them for food.

Pollen Shower.—Dr. Currier exhibited specimens of pollen under the microscope, which fell during a shower a few weeks previous. In some places it had been observed one half inch deep, and gave to the surface on which it fell the appearance of being sprinkled over with sulphur, which lasted many days, and was quite general in this section of country. Previous to this shower a strong south wind prevailed for one whole day, and the atmosphere in the Memphremagog Valley was so hazy that the mountain tops three miles distant could not be distinguished. The speimens examined were mostly pollen of the White and Yellow Birch. These trees had blossomed very rapidly and luxuriently the present Spring, and was already to take its flight when this furious wind came.

SEPTEMBER 12, 1871.

Annual Meeting at Derby.

President HINMAN in the chair.

Officers.—The following officers were elected for the ensuing year, viz: Geo. A. Hinman, president; H. A. Spencer, 1st vice president; E. P. Colton, 2nd vice president; J. M. Currier, secretary and treasurer; J. L. Edwards, auditor; J. G. Lorimer, curator and librarian.

Ozone.—Dr. Cutting remarked upon the haziness of the atmosphere and ozone. In all cases when he had collected microscopic particles from the atmosphere during the past Spring and Summer he had not failed to observe more or less White Pine pollen, and in many instances minute atmospheric algæ were found attached to the pollen grains. During the thunder shower last Sunday immense quantities of Pine pollen were brought down with the rain. Ozone was very constantly present in the atmosphere up to the 15th of August through all the hot weather and smoky days, and from that time to the 9th of September no ozone was detected. During this absence the atmosphere was tolerably clear, and northerly winds prevailed with cool nights; dysentery, cholera morbus, typhoid fever, and other diseases of a low type were prevalent, and very severe; many deaths occured in a short time.

His method of testing the ozone was with paper or cloth soaked in a solution of one grain of iodide of potassium and twelve grains of starch in one ounce of water. He kept a register of the amount of ozone daily, estimated by a scale from one to ten according to the discoloration of the test paper. But he found that the quantity of ozone in the atmosphere was not correctly registered or represented by the discoloration of the test. During high winds a greater quantity of ozone would come in contact with the test, to obviate this defect an aspirator was devised by means of which a given amount of atmospheric air was brought absolutely in contact with the test in a given time. He took two tin cans holding five gallons each, having their covers soldered on air tight, they were connected by a large connection stop-cock by perforating the center of each cover. Two small vent cocks, one on each can, were also put by the side of the connection; on the bottom of each can was also soldered a small stop-cock on which could be screwed a glass receiver for test paper, and the air by passing through a small glass tube was made to impinge upon the test, thus by filling the top can with water and arranging the test paper the water was allowed to pass through the connection stop-cock into the bottom can, which brought five gallons of atmospheric air in forcible contact with the paper. Then by reversion bringing the full can at the top the like experiment could be repeated. Numerous specimens of atmospheric dust and pollen were exhibited at the close of the meeting.

Donations to Museum.—Feldspar from Newport, hornstone containing minute crystals of iron, used by the Indians for arrow heads, from Canoe Falls, N. H., 200 entomological specimens, mostly undetermined species, *from J. M. Currier;* chlorite slate, and conglomerate, from Troy, *from J. C. Kennedy;* one specimen of gold from Golden Chariot Mine, Silver City, Idaho Territory, *from A. D. Miller;* apatite from Ontario, phosphate of lime from vicinity of Charleston, S. C., one specimen of Baker Island guano, also lignite, kaolin clay, bog manganese, and hematite from Brandon, *from T. H. Hoskins.*

BIBLIOGRAPHICAL NOTICES.

Second Report of the Geological Survey of Indiana. Made during the year 1870, by E. T. Cox, State Geologist, assisted by Prof. John Collett and Dr. G. M. Levette.

This work is divided into counties, giving to each descriptions of the formations occuring in them. Numerous analyses of coal, mineral waters, and ores are given throughout the book making it of great value as a work of reference It is illustrated by woodcuts, maps, and diagrams of the various strata in different sections. Appended is a catalogue of the flora of Jefferson County, by A. H. Young.

Lepidoptera,—Rhophaloceres and Heteroceres, Indigenous and Exotic. With Descriptions and Colored Illustrations, by Herman Strecker. Box 111 Reading P. O., Berks Co., Pa.

The first number of this magnificent work appeared in Jan. 1872. It gives finely colored figures of Platysamia Gloveri, Nov. Sp. The work is well executed and will be a valuable addition to Entomological Science. Price 50 cents per number.

Annual Record of Science and Industry for 1871. Edited by Spencer F. Baird. with the assistance of eminent men of science. pp 634. Harper & Brothers, New York.

This work furnishes short accounts of the more important discoveries in the various branches of science and industry during the year 1871. The author's name is sufficient to recommend it.

The Lens. A Quarterly Journal of Microscopy and the Allied Natural Sciences; with the Transactions of the State Microscopical Society of Illinois. Edited by S. A. Briggs, Chicago.

This promises to be a first class periodical, and we congratulate the editor and publication committee on the selection of matter and the very fine appearance in which their work is presented. We predict for it success.

Proceedings of the Third Annual Session of the American Philological Association, held at New-Haven, Ct., July, 1871.

Report of the Entomological Society of the Province of Ontario, for the Year 1871. By The Rev. C. J. S. Bethune, M. A.

The Physiology of Man. Designed to represent the existing state of physiological science, as applied to the functions of the Human Body. By Austin Flint, Jr., M. D., Professor of Physiology and Physiological Anatomy in the Bellevue Hospital Medical College, New York; etc., etc. pp. 470. D. Appleton & Co., 549 & 551 Broadway, New York.

This, the fourth volume of Prof. Flint's Work on Physiology, treats exclusively of the Nervous System. This volume with Prof. Hammond's treatise on Nervous Diseases forms a complete work on the "Physiology and Pathology of the Nervous System." Prof. Flint promises a fifth and last volume, upon the Special Senses and Generation, which will be completed within one year.

Bromide of Potassium and Bromide of Ammonium. Their physiological and therapeutical action, in two parts. by Edward H. Clarke, M. D., and Robert Amory, M. D. pp. 178. Published by James Campbell, Boston.

This handsome volume is the result of experimentation and observation. It will be found interesting and full of useful information.

A Treatise on Diseases of the Bones. By Thomas M. Markoe, M. D., Professor of Surgery in the College of Physicians and Surgeons, etc., etc. pp. 416. Published by D. Appleton & Co. 549 & 551 Broadway, New York.

This work contains the substance of the lectures which the author delivered during the past twelve years at the College of Physicians and Surgeons. He has not aimed to make it a compendium, but treats more particularly upon those branches which have been his opportunities to study. However, to make it a complete treatise, and bring it up to the present state of science he has brought forward the best authorities, and giving them due credit in all cases. It is illustrated with 105 wood cuts.

Elwell's Medical Jurisprudence. A Medico-legal Treatise on Malpractice and Medical Evidence, comprising the Elements of Medical Jurisprudence; by John J. Elwell, M. D., Professor in Ohio State and Union Law College and Western Reserve Medical College, etc., etc. pp. 600. Third Edition, Revised and Enlarged. Baker, Voorhis & Co., 66 Nassau Street, New York.

Dr. Elwell's work is received with great favor, both by the legal and medical professions. It is divided into two parts; the first is devoted to Malpractice, and in this branch it is the best authority on the subject. Both professions have long felt the need of a reliable work of reference in this branch of jurisprudence. Dr. Elwell has supplied this deficiency. The second part is devoted to Medical Evidence, and is fully up to the present state of jurisprudencial science. The whole combined make it the most practical, clear, and concise guide extant.

Clinical Lectures on the Diseases of Women. By Sir James Y. Simpson, Bart., M. D., D. C. L., Late Professor of Midwifery in the University of Edinburgh. Edited by Alexander R. Simpson, M. D. pp. 789. D. Appleton & Co., 549 & 551 Broadway, New York.

The greater portion of this work was published in the *Medical Times and Gazette* during 1859–61. Ten of the fifty Lectures, however, are here published for the first time. A copious Table of Contents and a full Index are introduced for reference. It is illustrated with 141 wood cuts These valuable contributions to gynæcological science are presented to the profession in a convenient form for reference, and much credit is due the publishers for the neatness in which they have done their work.

Medical Thermometry, aud Human Temperature. By C. A, Wunderlich, Professor of Clinic at the University of Leipzig, etc , etc , and Edward Seguin, M. D. pp 280. William Wood & Co., 27 Great Jones Street, New York

It is only within a few years that the profession generally have adopted thermometry as a means of diagnosis. Our author having had abundant opportunites of making observations in this branch renders the work before us a very reliable authority.

Ovarian Tumors: Their Pathology, Diagnosis, and Treatment, especially by Ovariotomy. By E. Randolph Peaslee, M. D., LL. D., Professor of Gynæcology in the Medical Department of Dartmouth College; etc., etc. With fifty-six illustrations on wood. pp. 551. D. Appleton & Co , 549 & 551 Broadway, New York

Prof. Peaslee prepared this work with a view of furnishing the medical profession with a text book on Ovarian diseases and Ovariotomy, Previous authors have published their individual experience without a view to this end, but in the volume before us the author has a wider scope, and presents us with a systematic treatise which the profession has for some time felt a want. Considerable time is taken in giving a history of the operation in various countries, giving to our own countryman, Dr. McDowell, the credit of performing the first operation.

Half-yearly Compendium of Medical Science. Part IX. Jan., 1872. S. W. Butler, M. D., 115 South Seventh Street, Philadelphia, Pa.

This is the only work of the kind that does justice to American medical literature. It forms a large octavo volume in a year, making a convenient work for reference of the most important contributions to medical science. It is not, however, exclusively American.

Transactions of the Medical Society of the State of New York, 1871. pp. 490.

Transactions of the twenty-first Anniversary Meeting of the Illinois State Medical Society, May 16, 1871.

Transactions of the Georgia Medical Association, 1872.

Transactions of the Minnesota State Medical Society, 1872.

Transactions of the Medical Society of the State of California, 1870–1.

ARCHIVES OF SCIENCE.

VOL. I. JANUARY, 1874. No. VII.

Direction of the Wind in Local Thunder Storms, by Hiram A. Cutting, A. M., M. D., State Geologist, Lunenburgh, Vermont.

After more than twenty-five years experience as a meteorological observer, having kept full notes of special incidents that seemed in any way peculiar, I present to you here for consideration such observations as seem to me of interest in connection with three local thunder storms. I would preface these remarks with the statement that in July, 1850, at Franconia, N. H., I was exposed in a buggy to the fury of one of those local showers that pour rain in torrents, accompanied by some hail, and much thunder and lightning.

As I was riding leisurely along I observed a small black cloud almost directly over head. It increased with great rapidity, and in ten minutes the torrent came down, The wind was in gusts from all points of the compass, demolishing my umbrella in a twinkling, leaving me to the mercy of the elements. I was drenched in a moment, and in an indescribably short space of time the body of the buggy was full of water and overflowing, though near four inches in depth. The roads were like rivers, and everything was flooded.

In driving north three and one half miles I passed entirely out of the limit of the storm of hail and rain, but the wind for two miles further had been violent from the south, prostrating corn and some trees, and blowing down one barn. The next morning I repassed the ground and found that the southern limit of the storm was about six miles from its northern limit, and at that part, that the the wind was strong from the north, doing some damage. In the afternoon I visited the Iron Ore Hill in Lisbon, which lie west of the centre of the shower, and found the wind there had been strong from the east. Upon my return I examined carefully by the plants and trees and by inquiry into the direction of the wind, and found it in every instance, upon the westward side direct from the storm; and all described it as cool though the forenoon of the day of the shower was very hot and sultry, with so little wind that I was unable to learn its direction. As the eastern limit of the storm was towards the White Mountain range, and a wilderness, I could get no information of its extent or severity, only by the rise of the streams fed by it, which was very great on all little streams, within or running through the limit of a circle six miles in diameter.

Upon my return home to Concord, Vt., I resolved to investigate fully the next storm of similar import. I soon removed to Lunenburgh, where I now reside, but saw nothing of similar storms until June 30, 1856. The morning was sultry, the forenoon hot, with thermometer at 98°. The wind was unsteady, but from southerly points at about noon, a dark low cumulus cloud appeared in the west, which rapidly increased in size until it hung with inky blackness over the eastern part of Concord, about five miles away. At noon there was a strong breeze from the east setting directly towards this cloud, and quite steadily. At one o'clock, P. M., there was a hard gusty wind blowing directly from the shower, feeling quite chilly after the forenoon heat, and causing the thermometer to fall in a few minutes to 70°. The cloud hung over the same place for half an hour longer when it became lighter, and was soon broken up in fragments and dissipated. During the afternoon small showers came up round about, and at three it rained slightly at Lunenburgh.

The next morning hearing reports from the hail-storm, I went to the field of disaster. I found the storm of great severity, but of limited extent, all being within the radius of one half mile. When within a mile of the storm there were indications of a strong wind from the west, (I was approaching from the east), sufficiently so to blow down many trees beyond the limits of hail and rain. I found upon examination some trees blown down upon every side of the storm, yet the wind was invariably from the storm cloud. Upon inquiry I found the wind, as far as noticed before its commencement, blowing directly towards it from all quarters.

The storm though so limited was of unusual violence, in fact almost without precedent in this section. The lightning was terrific, striking trees, etc. The testimony showed the thunder the heaviest ever known, and was almost incessent. The cloud, to the parties living there, seemed, as it appeared to me five miles distant, to form directly over head; the atmosphere seemed very sultry while it was forming, with hardly a breath of air. I could not learn that there was any special direction of the wind, and think there was not enough to note. The cloud formed so rapidly that the farmers in their fields did not leave their work until an almost total darkness settled down upon them, yet with the opportunity of seeing a band of clear sky in all directions at the horizon but a few minutes before. There was a strange feeling of oppressiveness in the atmosphere.

When the storm commenced at one o'clock, P. M., a complete deluge of water first came down, followed almost immediately by hail-stones and chunks of ice, several inches in diameter, which seemed pressed to earth with a violent wind, chrushing branches down from the trees with fearful violence. The duration of the storm was no more than thirty minutes, yet in a circle one mile in diameter no green thing was left. The leaves, branches, and even the bark, were stripped from the orchards and shade trees. A sugar-orchard standing in the storm was destroyed in the same manner. The shingles from the roofs, and some boards, were battered from the buildings and broken in pieces by the ice. The glass and sash were all broken. The grass crop was entirely destroyed, so that the grass fields looked like plowed ground, and it was next to impossible to find straws more than two inches long. What became of the heavy crop of grass ready for the harvest I cannot say. Potatoes well hilled-up by twice hoeing were destroyed, and the ground leveled as though it had been done with a roller, and no stocks of potatoes or corn could be found upon all the ground.

The hail-stones and masses of ice were piled up like snow drifts in winter; and twenty-four hours after the storm, in one drift, by actual measurement, there were over twenty-five cords. Upon the outer edge of the storm where the outward wind was strong, there was only rain, and a mile from the centre there was only wind, which extended at least from five to eight miles away, how much farther I cannot say. The section over which the hail fell was left without a particle of verdure. No green leaves could be found. It presented a state of devastation as though the trees had all been stripped and the earth plowed and then pounded down. During the ensuing week there were several storms similar in their formation, and all accompanied with vivid lightning, heavy thunder, hail and rain, but of much less severity than the one described.

After this peculiar series of storms there were no marked instances of storms of this character until 1872. August 14th, of that year the town of Sheffield, Vt., was visited by a local storm of great severity. From the oppressive heat and calm of the morning, clouds rapidly formed, and hanging stationary overhead, the storm between 9 and 10, A. M., burst upon the place. This storm was of much greater extent, covering a section of country five or six miles in diameter. These clouds continued to send down their deluge of rain and hail for three hours. Small brooks were changed to streams ten or twelve feet deep. The bridges were all swept away. The lightning struck several times, and several farms had fields of acres in extent washed away, and other land was covered by the debris to the depth of six or eight feet. In the central part of the storm the wind blew in gusts from all points of the compass, and outside of the storm the wind first set towards the cloud from all points, then from it, as before described, seeming very cool. During the afternoon showers spread about the country in all directions, but in usual form and not of unusual severity. September 8th, a similar storm came directly under my observation in the northern part of Lunenburgh. Though of great violence one mile north of my place I was enjoying sunshine. As in other cases it seemed to form overhead and remain stationary. The weather being as before described. No perceptible wind, but the vane pointing south-west. At the first formation of the cloud the wind set towards it in a steady breeze, then from it, cool and gusty. In the area of the storm the rain and hail fell in torrents; the darkness was almost like that of night.

Having been led by former observations to know what I might expect, I was on the ground almost as soon as the rain ceased. I found fifty rods within the storm the roads washed out so to be impassible, and leaving my horse I walked where water would permit. The apples and most of the leaves were knocked off the apple trees by the hail-stones, though they were not large. Grain not harvested was spoiled. Ligtning struck but once within the area of the storm though the flashes were described as incessant. Everything showed a great fall of water, though it was nowhere measured. Around the skirts of the storm the wind was cool, and outward blowing quite a gale for several miles. A portion of the storm cloud passed off to the south-west showering moderately.

These of course are marked instances, yet many have noticed a tendency to, first an inward, and then an outward wind, in hard showers, while those passing rapidly over the country, as the saying is, pass against the wind. It however shifts a few minutes before the rain-fall. After a shower has passed, it frequently leaves a delightfully cool breeze blowing from it. At the sides of the showers however the wind is fitful and gusty, seldom blowing directly to or from them. I respectfully present these facts, hoping that others may observe them until the theory of hail-storms, and local showers of great severity is better understood. I give no theory, but let the facts stand out for consideration, as to whether they may not lead to a better understanding of the formation of such storms.

Catalogue of the Flowering Plants of Vermont.—By Professor George H. Perkins, Ph. D.—Continued from page 190.

Order.—LEGUMINOSÆ.

LUPINUS PERENNIS, L. *Common Lupine.* This plant grows very abundantly and thriftily on sandy hillsides and along the borders of open pine woods. Specimens with white flowers are not very rare; last of May.

TRIFOLIUM *ARVENSE, L. *Rabbit-foot Clover.* Dry fields: not common; July.

T. *PRATENSE, L. *Common Red Clover.* Fields; common: June.

T. REPENS, L. *White Clover.* Common: last of May.

T. *AGRARIUM, L. *Yellow Hop-Clover.* Sandy fields near Burlington; not common; June.

T. *PROCUMBENS, L. *Low Hop-Clover.* Roadsides and fields; common in limited localities but not often occupying extended spaces; June.

MELILOTUS *OFFICINALIS, Willd. *Yellow Clover.* Not at all common in most parts of Vermont; June.

M. *ALBA, Lam. *White Sweet Clover.* More common than the preceding though not abundant; along roadsides and waste ground: July.

MEDICAGO *LUPULINA, L. *Nonesuch.* Rare; South Hero, Robbins and a few other places; June. The common Lucerne, M. sativa, is somewhat cultivated as a forage plant.

ROBINIA PSEUDACACIA, L. *Common Locust.* Common in cultivation, and growing spontaneously in many places: June.

R. VISCOSA, Vent. *Rose Acacia.* Very sparingly escaped from cultivation about deserted dwellings and so may perhaps be regarded as having become naturalized; June.

ASTRAGALUS CANADENSIS, L. *Vetch.* Not common; rocky shores af Lake Champlain.

A. ROBBINSII, Gray. Phaca Robbinsii, Oakes. This species is quite common in a restricted locality near Burlington, where it grows on the rocky banks of the Winooski river and also on large rocks in the bed of the stream which are covered only when the river is very high. It has also been found by Mr. C. C. Frost on Willoughby Mountain, but I do not know of its existence anywhere else though Wood (Class-Book of Botany, page 318), says, "Ledges by rivers and lakes, northern Vermont." Last of May.

HEDYSARUM BOREALE, Nutt. Rare; Willoughby Mountain, Wood; June.

DESMODIUM ACUMINATUM, DC. *Trefoil. Ticks.* Rather common in dry woods: August.

D. CANADENSE, DC. *Trefoil. Beggar-Lice.* Common along large streams and in woods: July.

D. CANESCENS, DC. Dry soil: not common; August.

D. DILLENII, Darlingt. Dry woods in the southern part of the State and very sparingly to the northward; August.

D. NUDIFLORUM, DC. *Beggar Ticks.* Common; August.

D. PANICULATUM, DC. Dry ground: August.

Lespedeza violacea, Pers. *Bush Clover.* Dry, open woods; August.

L. hirta, Ell. Dry soil; August.

L. capitata, Michx. *Common Bush Clover.* Pastures and dry fields; common; August.

Vicia *sativa, L. *Vetch.* Common in fields and along hedges; July.

V. Cracca, L. *Vetch.* Common; June.

Lathyrus maritimus, Bigel. *Beach Pea.* Grows sparingly along the sandy shores of Lake Champlain; June.

L. ochroleucus, Hook. *Yellow Pea.* In thick patches on high bluffs along Lake Champlain, also on several of the islands in the Lake, as Valcour's, South Hero, etc., elsewhere very rare; June.

L. palustris, L. *Marsh Pea.* Sandy shores of Lake Champlain; not common; July.

L. palustris, var. myrtifolius, Gray. Not common; July.

Apios tuberosa, Mœnch. *Wild Bean. Ground-nut.* Common in damp thickets; August.

Amphicarpæa monoica, Nutt. *Ground-nut.* Common in damp thickets and in pine groves along the base of cliffs; July.

Cassia Marilandica, L. *Wild Senna.* Southern parts of the State; not very common; August.

Order.—ROSACEÆ.

Prunus Americana, Marsh. *Wild Yellow Plum.* Not very common; rather moist ground; May.

P. pumila, L. Cerasus pumila, Michx. *Dwarf Wild Cherry.* Rocky shores of Lake Champlain; not common; June.

P. Pennsylvanica, L. Cerasus Pennsylvanica, Ait. *Wild Red Cherry.* Common in fields and along borders of groves; May.

P. VIRGINIANA, L. Cerasus Virginicus, DC. *Choke Cherry.* Common in pastures and groves; May.

P. SEROTINA, Ehrh. Cerasus serotina, DC. *Wild Black Cherry.* Common in similar localities to those of the last; May.

SPIRÆA SALICIFOLIA, L. *Meadow Sweet.* Not very common, much less so than the following; June.

S. TOMENTOSA, L. *Hardhack.* Pastures and fields; common; July.

AGRIMONIA EUPATORIA, L. *Agrimony.* Rather common in moist places; July.

POTERIUM CANADENSE, Gray. Sanguisorbia Canadense, L. *Common Burnet.* Swamps, Brattleboro, C. C. Frost; August.

Notes on the Winooski Marble of Vermont.—By Professor George H. Perkins, Ph. D., Burlington, Vermont.

About three years ago while looking over a large pile of cast-away fragments of slabs of Winooski Marble near Mr. Barney's mill in Swanton, I found one piece about five inches square which was thickly filled with what were obviously organic remains. Not being familiar with the paleontology of the region at that time I did not recognize the species to which the fossil should be referred but knowing that no fossils had ever been detected in the marble I had the specimen polished, and laid it aside for further study. A few months later in company with Mr. S. M. Allis I again visited the Swanton Marble Mill and we were successful in finding about a dozen medium sized pieces of the marble which contained the same fossils in greater or less abundance. One of these pieces was afterwards shown by Mr. Allis to Mr. Billings, the paleontologist of the Canada Survey, who at once recognized the fossils as a species of a genus. *Salterella*, named by him in 1861 to include certain fossils from limestone of the Potsdam group at Anse au Loup, North Shore of the Straits of Belle Isle in Canada. In a note published in the *American Journal of Science and Arts*, Vol. III, page 145, Third Series, Mr. Billings mentions the fossils of the Winooski marble and refers them to his species, *Salterella pulchella*. His description of the fossil taken from a brochure entitled "*New Species of Lower Silurian Fossils*," page 18, is as follows: "Elongate conical gently curved, six to eight lines in length and one line to one and a half in width at the aperture. Surface ornamented with small encircling striæ just visible to the naked eye."

As in specimens from the Winooski marble from Swanton and also in those from Mallet's Bay near Burlington the *Salterella* is only to be seen distinctly after the stone is sawn and so only in section. its appearance differs somewhat from that in the specimens from the Straits of Belle Isle which furnished the description quoted above. In section the fossil resembles a series of thimble-shaped bodies placed one within the other, the first forming a cup-like cavity in which the animal lived. It is believed to have been an annelid, though Prof. Dana, *Manual of Geology* page 187, seems to think it may have been a pteropod mollusk. The fossils in the Winooski marble are from .13 in. to .23 in. long and from .09 in. to .12 in. broad at the aperture.

As the fossils lie imbeded in the rock in all positions we have in the cut slabs sections crossing the cylindrical shell in all directions so that the appearance at first glance is that of a number of different species, but thus far I think but one species has been certainly identified, though it is probable that there are more. The fossils, as they are white, show distinctly on the red background of the rock after it has been sawn, but as fragments of calcareous rock of white or light color of all shades and sizes are scattered through the red cementing material, fossils are not very easily distinguished from the fragments on a fractured surface.

They do not appear to be at all common as a diligent search has thus far enabled us to procure but a very limited number of pieces of stone containing them. Nor do they cover large patches in the rock usually, most of the clusters are not larger than the palm of the hand and such a cluster may occur alone in the midst of a large slab of marble. In one specimen which I found they covered, in some places so thickly as to form a compact mass, a surface twenty inches in diameter, but I have seen no other specimen that approached this in size.

They never occur sprinkled through a large mass of stone but always in clusters having from thirty to fifty sections in a space an inch square. Nor do they form thick layers, very rarely do they appear at all on both sides of a slab an inch in thickness; usually they do not seem to form a layer more than half an inch in depth. The marble occurs in "beds" from one to six feet thick, the outer surface of the bed or layer is, to a slight depth, of light color and shows to but a slight extent the character of the stone. It is near this outer surface of the blocks that the *Salterella* occurs. I believe that in no case have any been found in the middle of a block; so my own investigations have shown and so I am assured by Mr. Barney from whom I have obtained several pieces.

Besides the *Salterella* I have seen bodies in the marble which I have no doubt were fragments of fossils but they were too imperfect to be identified. One piece however contained sections of what I believe to be identical with, or at least very closely allied to, the *Archeocyathus Atlanticus* Billings, figured and described in the above mentioned work page 4, and also on page 283 of *Geology of Canada*. It is rather uncertain work to try to identify such fragments of fossils as the rock may contain as they are much broken and are mixed with great numbers of similar fragments which are not fossils from which they cannot be certainly distinguished.

In addition I wish to say a few words in regard to the formation in which the marble occurs beginning with the marble itself. This is a dolomite containing considerable silica and iron. Much of it is a breccia ; the angular fragments are of lighter color than the cementing material in nearly all cases and have obviously been but little disturbed since broken as it is not uncommon to find several fragments near together, separated, it may be, by but the tenth of an inch, which evidently would fit exactly together could they be moved. The better varieties of the stone are very hard, compact, durable, take a high polish and are very beautiful. All shades of red from the most delicate flesh-color to deep chocolate brown occur, in all cases mingled with pure white, sometimes in equal proportions, sometimes the lighter colors predominating, sometimes the darker. I doubt if anywhere a greater variety can be found than occurs in any lot of fragments of the Winooski marble. In fact it is much more difficult often to find two pieces from different beds exactly alike than it is to find two quite different.

Some of the slabs from the same layer of course resemble each other quite closely, but not infrequently a block will afford forty or fifty slabs each noticeably different from the rest. The arrangement of the light and dark shades varies in different blocks and in the same blocks sawn in different directions. Sometimes the colors appear more or less distinctly stratified, sometimes the light masses are of definite form, sometimes they are large, sometimes small, varying from the size of a pea to several inches long and broad. Some of the beds do not exhibit with any distinctness the brecciated structure but are clouded, the different colors mixing and shading into each other with no definite borders and in this way many very beautiful shades are produced.

The stone endures exposure to the weather almost as well as granite, perhaps quite as well, but its color fades so that it loses much of its beauty after long exposure, but for indoor work it cannot be surpassed in durability. It is not easily attacked by acids, is not easily stained or scratched and its richness and variety of color commend it to all and I believe that it never fades when not directly exposed to the action of sunshine and storm.

The Winooski marble forms a part of a formation well known to geologists as the Red Sandrock af Vermont, a formation over which many battles have been waged aud whose age is scarcely regarded as entirely settled even now by some, though most have no doubt of its position as a part of the Potsdam Group. This Red Sandrock extends through western Vermont from near the Canada line southward to near Shoreham dipping to the eastward. It consists of some sandstone but quite as much, perhaps more, of dolomite, with some slate. It is usually a fine grained, compact rock not easily broken and in many places contains species of trilobites and mollusks characteristic of the Potsdam. The thickness of the Red Sandrock formation is given by Sir William Logan in a section taken near Swanton as follows:

White and red dolomites with sandy layers (In part Winooski marble)	370	feet.
Gray argillaceous limestone with sea weeds	110	"
Buff sandy dolomite weathering brown	40	"
Dark gray and bluish black slate with thin bands of dolomite	130	"
Other measures, dolomites. sandstones, and limestones	60	"
Total thickness of section	710	feet.

The above section gives a very good idea of the most prominent members of the Red Sandrock formation. The whole thickness of the formation is over 2,000 feet. The mottled dolomite, whose more compact beds are the Winooski marble, does not occur, so far as I am aware, farther south than Mallet's Bay six miles north of Burlington. South of this point it becomes sandrock, though not always red but it loses its mottled character and is nearly of a uniform shade from dark red to reddish dove color. Its chemical composition varies considerably. The dolomite portion contains lime and magnesia in the form of carbonates and in about equal proportions. silica to the amount of from 10 to 20 per cent, and alumina and iron together in about the same amount.

Editorial.—We tender our thanks to the citizens of the City of Burlington, for so generously subscribing for the First Series of this Journal, and thus enabling us to proceed with its publication. It is our aim after the publication of the Flowering Plants of the State by Prof. Perkins and the Flowerless Plants by Mr. Frost, to devote the Journal to more popular matter on scientific subjects; in the mean time, however, we shall give one or two articles of a more popular character than mere lists, in each number. We hope to be able at no distant date to issue it oftener than four times a year, and in a much larger size. Heretofore the Journal has been somewhat irregular in its appearance, but now we feel confident of its being out on time. The paging has been arranged convenient for binding when the Series is completed.

BIBLIOGRAPHICAL NOTICES.

Pre-Historic Races of the United States.—By J. W. Foster, LL. D. pp 415. S. C. Griggs & Co., Chicago, Illinois.

The evidences of a race of human beings who inhabited the earth at a very remote period, perhaps in pre-Adamite times, are attracting the attention of scientific observers at the present time. That such a race existed upon this Continent, differing in character and customs from the race who dwelt here at the time of the discovery of America, we have reason to believe. We have in this work the embodiment of such materials as relate to this subject in the United States. The work is a credit to both author and publishers.

Year-Book of Nature and Popular Science for 1872. By J. C. Draper, M. D. Scribner, Armstrong & Co., New York.

This work embraces extracts from the most important papers that have appeared during the previous year.

Lepidoptera.—Rhophaloceres, und Heteroceres, indigenous and exotic. By Herman Strecker, Reading, Pa.

Number II, illustrates: Papilio Indra; P. anticostiensis, Nov. Sp.; P. pilumnus; and Pieris menapia. Number III, illustrates: Catocala tristis; C. viduata; C. lacrymosa; C. obscura, Nov. Sp.; C. relicta; C. briseis; C. faustina, Nov. Sp.; C. coccinata; and C. cerogama.

Fourth and Fifth Annual Reports of the Noxious, Beneficial, and other Insects, of the State of Missouri. By C. V. Riley, State Entomologist. pp. 145 and 160.

Inductive Inquiries in Physiology, Ethics, and Ethnology. By A. H. Dana. pp 308. A. S. Barnes & Co., New York.

Fourteen Weeks in Human Physiology. By J. Dorman Steele, Ph. D. pp 238. A. S. Barnes & Co., New York.

ARCHIVES OF SCIENCE.

Vol. I. APRIL, 1874. No. VIII.

Observations on Ozone, and its Relation to Disease.—By Hiram A. Cutting, A. M., M. D., State Geologist, Lunenburgh, Vermont.—Delivered at the fifty-third Annual Meeting of the White Mountain Medical Society, January 7th, 1874.—Published by Vote of the Society.

To the physician as well as to the chemist, or meteorologist, perhaps no subject possesses more attraction than that of ozone. Whether it is considered in relation to its supposed functions in the atmosphere, or its presumed connection with various diseases, or even the partial mystery of its origin, or if we speculate on its relation to oxygen we find it a subject of peculiar interest. When we commence investigations concerning it we start off under many disadvantages. Observers are contradictory in their statements, and it is a world of theory with only now and then an isolated fact.

The amount of ozone in the atmosphere is seldom if ever correctly estimated; like measuring the velocity of the wind we can approximate towards correctness; but to say that we can accurately determine the exact quantity would be at least a very doubtful statement. Yet this determination must be the foundation of all accurate knowledge in relation to its effects. Various methods have been employed to ascertain the presence of ozone in the atmosphere, among which are iodide of potassium with starch, and also with various other compounds. Gum guaiacum, thallium, etc., all of which I have experimented with, but I shall speak in detail of one only. The iodide of potassium and starch is perhaps the easiest to manage, and with pure iodide free from iodate with which it is frequently combined, it may be prepared by dissolving one part of the iodide in two hundred parts of distilled water, to which solution ten parts of finely powdered starch may be added, and all gently heated until it is thickend like starch used by the laundress. In this solution while warm dip strips of bleached cotton cloth which have been thoroughly cleansed and previously dried, squeeze out the excess of starch and hang before a hot fire to dry. Cloth thus prepared should be white and quite stiff with the starch. Next cut in strips one inch wide and three inches long, and put up in ground stoppered bottles. In this way it may be kept any length of time desired. When wanted a strip can be removed and exposed in a sheltered situation, away from sunlight and manifest causes of impurity in the atmosphere.

A wooden box open at the top and bottom two feet long and four inches square, hung against a tree, I have found as good as any other more expensive arrangement. After proper exposure the color must be noted. I have adopted the scale of ten shadings, from the lightest tint to the darkest brown we ever obtain. This is the same scale adopted in Europe. Several exposures in different manners at the same time are desirable as by comparison your result becomes more valuable.

This test has been condemed by many. and I must admit that it requires attention to remedy its defects. The most grave is the combination of iodate in the salt used which may be detected by tartaric acid. This disengages from the iodate hydriodic and iodic acids. which immediately react on each other producing free iodine and water; while tartaric acid has no immediate effect upon the iodide beyond the slow formation of hydriodic acid. This if long exposed will combine with oxygen from the atmosphere producing water and free iodine. When, however small a trace of iodate is present discoloration immediately takes place proportionate to the amount. Again dampness hastens the discoloration and so the relative humidity should be taken into account. Iodate of potassium may form on your test strips and prevent discoloration, being exactly equal to what would have been set free by the ozone, provided no iodate had been formed. This may be counteracted and the iodine set free by a spray thrown upon the test from a solution of tartaric acid by a common atomizer and you will then have the proper shade.

I have entered this much into detail to show how observers by want of proper care may have fallen into errors, and thus have arisen the contradictory opinions expressed by various writers. What ozone is has but recently been established; but thanks to Andrews and

Soret as well as other eminent men that have lent their aid to our present knowledge, which enables us to state that ozone is a condensed or allotropic form of oxygen, and they are mutually convertable the one into the other without the production of any other body.

Ozone is active as a disinfectant or deodorizer removing all noxious odors; but it is also an active oxidizer of metals. Silver or even gold is tarnished by it. To show its purifying power I will detail one experiment which any person can repeat at will. I know of but one substance more offensive than putrid flesh. and that is putrid blood. Yet blood may be exposed to the atmosphere until quite putrid. and the clot softened then put in a bottle where after some time the clot will dissolve as a result of alkaline decomposition. In this state you cannot imagine a more offensive fluid; yet by passing a current of ozone through it or even over it, the bad smell will all pass away or be neutralized rather; and the mass will become quite sweet. From this you can see that ozone is an active agent that under the directing power of man may accomplish much.

How large a part it plays in the production of edible products from old bones, and other nauseous substances, I do not pretend to know. As ozone is not a natural condition of oxygen of course its production concerns us, and how it is produced in nature; and how it may be produced so as to be of use to the physician, chemist or manufacturer is of great importance. In nature the oxidation of metals, the decomposition of rocks, the germination of seeds, the growth of plants, especially the atmospheric algæ, the falling of rain, hail, or snow, the evaporation of saline fluids, the dashing of the waves of the ocean on the coast currents, in the atmosphere clouds and many other of the phenomena of nature, are all concerned in the simultaneous production of electricity and ozone. The French Academy have ascertained that much ozone is developed under the action of blowing machines. This may in part account for the healthful action of winds.

As ozone, to be of advantage to the physician, must be developed at his will, I will state that it is easily produced by the electric current as follows: A sufficient battery is required to give an inch spark with a coil. A glass tube about two and a half feet long having a half inch bore at one end and near the other contracted to one-eighth of an inch. Pass a wire from the coil into the large end of this tube and out at the side near the point of contraction. Melt sealing wax around the wire so as to prevent the air from passing in or out at the side of the tube, but leave the ends open. Coil the other wire from the electric coil around the outside of the tube following the tube down to the point of exit where connect the wires, and pass the current of electricity. By passing the air through this tube slowly the oxygen will be changed to ozone. The conducting wires from such a coil will always give more or less ozone which, in a common sized room, can easily be detected by the smell. It is thought that one-millionth part of ozone in the atmosphere can be thus detected.

It has a pungent smell which has been compared to the smell of sulphur. By rubbing a rubber comb ozone and electricity will both be evolved and you can thus get the odor distinctly. It can frequently be observed in a building after it has been struck by lightning. It was observable four weeks afterwards in a house in Kirby struck by lightning two years ago. It is sometimes faintly perceptible during or after thunder storms as I have myself twice observed. If an electric coil is not at hand so you can take advantage of electricity, you can readily produce ozone by the action of strong sulphuric acid upon permanganate of potassium. It is only necessary to mix very gradually three parts of the acid with two parts of the salt, and this mixture will not only give off ozone abundantly but will not cease to give it off for months. You will at once see that in this way it can be introduced into any invalid's chamber when desirable, and it can thus be used for the purification of the air of hospitals or public assemblies.

As it is evolved by electricity and also by chemical action it would seem almost certain that it would be a constant ingredient of our atmosphere. As we have seen it is by no means a passive agent and the query will at once arise as to its effect upon animate nature. The result of my experiments as well as that from the experiments of others, show that an ozonized atmosphere will produce an irritation of the mucous membranes of the nostrils, throat, conjunctivæ, and even congestion of the lungs. It accelerates respiration and circulation, excites the nervous system, and those effects continue after the withdrawal of the cause.

Of this I have had ample experience, and will say that when following up experiments upon ozone for some days, I had an attack akin to pneumonia which came near being serious. I was attended by Dr. Fulsom who can state that the active stage of inflammation was very severe, though the recovery was rapid beyond precedent. I did not then realize the cause, but have since observed the results too often to be mistaken. Not that I intend to take averdoses of ozone but in experiments with it enough escapes into a room when closed as in cold weather to produce these effects.

Reasoning from this we should infer that a class of diseases with such a diagnosis, might have their severity increased by a an increase of ozone, even if an increased amount did not induce them. Further as ozone is fully settled to be one of the elements of our atmosphere a want of or a minimum quantity of such an active agent might cause diseases of an opposite character.

(*Continued in the next number.*)

Catalogue of the Flowering Plants of Vermont.—By Professor George H. Perkins, Ph. D.—Continued from page 218.

Order.—ROSACEÆ.

GEUM ALBUM, Gmel. *White Geum.* Not common; borders of groves and about fences; May.

G. VIRGINIANUM, L. *Avens. Geum.* Low ground and damp woods; not very common; June.

G. STRICTUM, Ait. Low ground; not common; June.

G. RIVALE, L. *Purple Geum. Water Avens.* Swamps and moist places; common; June.

WALDSTEINIA FRAGARIOIDES, Tratt. *Barren Strawberry.* Very common along the borders of woods; middle of May.

POTENTILLA NORVEGICA, L. *Cinque-foil.* Fields; common; June.

P. CANADENSIS, L. *Common Cinque-foil.* Common in dry fields, pastures and roadsides; May.

P. ARGENTEA, L. *Silvery Cinque-foil.* Common in fields and along roadsides; June.

P. ARGUTA, Pursh. Interval land and moist ground; common; June.

P. ANSERINA, L. *Silver Weed. Goose Weed.* Common on sandy or low rocky shores of Lake Champlain; July.

P. FRUTICOSA, L. *Shrubby Cinque-foil.* Rocky banks of Winooski and elsewhere on ledges; not common; May.

P. TRIDENTATA, Ait. *Mountain Cinque-foil.* Near Summit of Mansfield and Camel's Hump mountains; July.

P. PALUSTRIS, Scop. Comarum palustre, L. *Marsh Five-Finger.* Swamps; rare; last of June.

FRAGARIA VIRGINIANA, Ehrh. *Wild Strawberry.* Less common usually than the next; May.

F. VESCA, L. *Wild Strawberry.* Common in fields; May.

DALIBARDA REPENS, L. Common in moist woods and on mountain sides; June.

RUBUS ODORATUS, L. *Flowering Raspberry.* Abundant on shaded rocky hillsides and along forest roads; June.

R. TRIFLORUS, Rich. *Dwarf Raspberry.* Not abundant; moist ground; May.

R. STRIGOSUS, Michx. *Common Red Raspberry.* Very abundant in moist fields, on rocky hillsides and over clearings; May.

R. OCCIDENTALIS, L. *Black Raspberry. Thimbleberry.* Common though much less so than the preceding species; May.

R. VILLOSUS, Ait. *High Blackberry.* Common along the borders of mountain forests, in damp fields and in rocky soil; June.

R. CANADENSIS, L. *Low Blackberry. Dewberry.* Fields and hillsides; June.

R. HISPIDUS, L. *Running Blackberry.* Swamps and moist places; June.

ROSA CAROLINA, L. *Wild Rose.* Rocky pastures, roadsides, etc.

R. LUCIDA, Ehrh. *Smaller Wild Rose.* Shores of Lake Champlain; not common; June.

R. BLANDA, Ait. *Early Wild Rose.* Common on high ground; June.

R. *RUBIGINOSA, L. *Sweet Brier. Eglantine.* Rocky pastures; not common; June.

CRATÆGUS COCCINEA. L. *Hawthorn.* Common in thickets; May.

C. TOMENTOSA, L. *Black Thorn. Black Haw.* Found chiefly in the southern part of the state; June.

C. TOMENTOSA., var. PUNCTATA, Gray. C. punctata, Jacq. Not common; May.

C. CRUS-GALLI, L. *Cockspur Thorn.* Common in many places; June.

PYRUS ARBUTIFOLIA, L. *Choke-berry.* Common in dry woods; May.—var. ERYTHROCARPA. *Red Choke-berry.* Dry woods; May.—var. MELANOCARPA. *Black Choke-berry.* Swamps and wet places; May.

P. AMERICANA, DC. *Mountain Ash.* Common in mountain forests, reaching nearly to the summits of many of the higher mountains, also grows sparingly in swamps; June.

AMELANCHIER CANADENSIS, Torr. and Gray. *Shad Tree. June-berry.* Very common along the borders of fields and on hillsides; May.—var. BOTRYAPIUM, Gray. Common along borders of woods; May.—var. OBLONGIFOLIA, Gray. Common in woods and fields; May.—var. ROTUNDIFOLIA, Gray. Rocky hillsides along rivers; May.—var. OLIGOCARPA, Gray. Summits of the higher mountains and very rarely in swamps; June.

Order.—SAXIFRAGACEÆ.

RIBES CYNOSBATI, L. *Wild Gooseberry.* Common in rocky woods; May.

R. LACUSTRE, Poir. *Swamp Gooseberry.* Not common; swamps and mountain forests; May.

R. PROSTRATUM, L'Her. *Mountain Currant.* Mountain forests; not common; May.

R. FLORIDUM, L. *Wild Black Currant.* Woods; not common; May.

R. RUBRUM, L. *Common Garden Currant.* Swampy and rocky places; not very common; May.

Catalogue of the Cryptogamous or Flowerless Plants of Vermont.—By C. C. Frost, Brattleborough, Vermont.—Continued from page 195.

LICHENES.*

Ramalina calicaris, Fr.: trees, rails, etc.—*a.* fraxinea, Fr.; trees, rails, etc.—*b.* fastigiata, Fr.; trees, rails, etc.—*c.* canaliculata, Fr.; trees, rails, etc.—*d.* farinacea. Schær.; trees. rails, etc.

Cetraria Islandica, Ach. Mansfield Mountain.

C. cucullata, Ach. Mansfield Mountain.

C. nivalis, Ach. Mansfield Mountain.

C. aleurites Th. Fr. Mansfield Mountain.

---

*I herewith tender my thanks to Prof. Edw. Tuckerman, of Amherst, Mass., for the revision of this department of my Enumeration of the Flowerless Plants of Vermont, and for many valuable additions made by him, which has so greatly enhanced its value. C. C. Frost.

C. glauca, Ach. Trunks, stones. etc.

C. sepincola, Ach. Mansfield Mountain.

C. Fahlunensis, Schær. Mansfield Mountain.

C. lacunosa, Ach. Trees, rails, etc.

C. aurescens, Tuck. Trunks and branches of Coniferæ.

C. Oakesiana, Tuck. Trees in forests.

C. juniperiana,—var. virescens, Tuck. Mansfield Mt.

C. pinastri, Sommerf. Mansfield Mountain.

C. ciliaris, Ach. Trees; common.

Evernia prunastri, Ach. Trees.

E. furfuracea, Mann.; trunks, fertile.—var. cladonia, Tuck.; trunks, fertile.

Usnea barbata, Fr.; mostly on trees.—*a.* florida, Fr.; mostly on trees.—*b.* strigosa, Ach.; mostly on trees.—*c.* rubiginea, Michx.; mostly on trees.—*d.* hirta. Fr.; rails.—*e.* dasypoga, Fr.; trees.

Alectoria jubata; rails, infertile.—var. chalybeiformis, Ach.; rails, common.—var. implexa, Fr.; trees in mountain woods.

Theloschistes chrysophthalmus, Norm. Trees.

T. parietinus, Norm.; trunks and rocks.—var. polycarpus, Fr.; trunks and rocks.—var. lychneus, Nyl.; trunks and rocks.

T. concolor, (Dick.) Tuck. Trees.

Parmelia perforata, Ach.; trunks.—var. crinita. Tuck.; trunks.

P. perlata, Ach.; rocks and trees.—var. olivetorum; rocks and trees.

P. tiliacea, Ach. Trunks and rails.

P. Borreri, var. rudecta, Tuck. Trunks.

P. saxatilis, Ach. Rocks and stones.

P. lævigata, Ach. Trunks.

P. pertusa, Schær. Rocks.

P. physodes. Ach.; dead wood and rocks.—var. enteromorpha, Tuck.; dead wood and rocks.

P. colpodes, Ach. Trees.

P. olivacea, Ach.; trunks.—var, panniformis, Nyl.; trunks.—var. sorediata, Nyl.; trunks.

P. stygia, Ach. Rocks.

P. caperata, Ach. Trunks and stones.

P. conspersa. Ach.; rocks and stones.—var. stenophylla; rocks and stones.

P. centrifuga, Ach. Rocks in mountains.

Physcia ciliaris, var. angustata, Tuck. Devil's den, Willoughby Lake.

P. aquilla, var. detonsa, Tuck. Rocks and trees.

P. pulverulenta, Fr.; trunks.—var. pityrea; trunks.

P. stellaris, Wahl.: trunks, dead wood and rocks.—var. astroidea. Ach.; trunks, dead wood and rocks.—var. tribacia, Fr.; trunks, dead wood and rocks.

P. stellaris. Wallr.: trunks, rocks, etc.—var. aipolia, Schær.; trunks, rocks, etc.—var. hispida, Fr.; trunks. rocks, etc.

P. cæsia, Ach.; rocks. stones and dead wood.—var. stellata, Fr.; rocks, stones and dead wood.—var. tribacia, Fr.; rocks. stones and dead wood.

P. speciosa, Ach.; trunk and rocks.—var. hypoleuca, Mich.; trunks.

P. obscura, Fr. Trunks.

Pyxine Cocoes, var. sorediata, Tuck. Trunks.

Umbilicaria Pennsylvanica, Hoffm. Rocks.

U. pustulata, var. papulosa, Tuck. Rocks.

U. proboscidea, DC. Stenh. Rocks. Mansfield Mt.

U. flocculosa, Hoffm. Rocks; Mansfield Mountain.

U. Dillenii. Tuck. Rocks.

U. erosa, Hoffm. Rocks; Mansfield Mountain.

U. hyperborea, Hoffm. Rocks; Mansfield Mountain.

U. Muhlenbergii, Ach. Rocks.

Sticta crocata, Ach. Mossy rocks.

S. pulmonaria, Ach. Trees and rocks.

S. quercizans, Ach. Mossy rocks.

S. glomerulifera, Ach. Trees and rocks.

S. tomentosum, Kœrb. Trunks.

Nephroma, lævigatum, Ach. , Trunks, etc.

N. Helveticum, Ach. Trees and rocks.

Peltigera aphthosa, Hoffm. Rocks among mosses.

P. canina, Hoffm. Rocks among mosses.

P. rufescens, Hoffm. Rocks among trees.

P. polydactyla, Hoffm. Rocks among mosses.

P. horizontalis, Hoffm. Rocks among mosses.

P. venosa. Hoffm. Earth in woods.

Solorina saccata, Ach. Limerocks. Burlington and Westmore.

Pannaria lanuginosa, Ach. Rocks, infertile.

P. microphylla, Stenh. Rocks in woods.

P. nigra, Nyl. Rocks in woods.

P. molybdæa, var. cronia, Tuck. Rocks in mountains.

P. crossophylla, Tuck. Rocks near streams.

P. rubiginosa, Ach. Trees.

P. leucosticta, Tuck. Rocks in woods.

P. flabellosa, Tuck. Stones near streams.

P. melamphylla,, Tuck. Rocks near streams.

Ephebe pubescens, Fr. Rocks in mountains.

E. solida, Born. Rocks in streams.

Synalissa polycocca, Nyl. Granitic rocks.

Omphalaria phyllisea, Wahl. Granitic rocks.

Collema pulposum, Ach. Earth.

C. leptaleum, Tuck. Trunks.

C. nigrescens, Ach. Rocks and trunks.

C. ryssoleum, Tuck. Granite rocks.

C. furvum, Ach. Calcareous rocks.

C. flaccidum, Ach. Rocks.

Leptogium tremelloides, Fr. Trunks and trees.

L. lacerum, Fr. Earth among mosses.

L. dactylinum, Tuck. Calcareous schists.

L. crenatellum, Tuck. Trunks near water.

L. myochroum, Ehrh. Trunks, infertile.

L. muscicola, Fr. Mossy trunks.

L. chloromelum, Sw. Hard bark of trees.

Hydrothyria venosa, Russell. In mountain rivulets.

Placodium elegans, DC. Rocks; Burlington, Willoughby Lake.

P. murorum, DC. Rocks and stones.

P. vitellinum, Ach. Dead wood and rocks.

P. cinnabarinum, Auri.

P. aurantiacum, Light.; old fences.—var. fulvum.; trunks and rocks.

P. cerinum, Hedw.; trunks, rocks and stones.—var. sideritis, Tuck.; rocks.

P. rupestre, Nyl. Limerocks.

Lecanora Frostii, Tuck. Granitic rocks.

L. muralis, Schær. Rocks and stones.

L. cervina, var. glaucocarpa, Sommerf.; limerocks.—var. squamulosa; granitic and limerocks.—var. discreta, Fr.; rocks.—var. privigna, Ach.; rocks.—var. pruinosa, Ach.; limerocks.

L. rubina, Vill. Rocks.

L. frustulosa, Ach. Rocks.

L. subfusca, Fr.; trunks and rocks.—var. discolor, Fr.; trunks, etc.—var. distans, Fr.; trunks, etc.

L. elatina, var. ochrophæa, Tuck. Trunks of Firs.

L. varia, Fr. Dead wood, stones and trunks.

L. pallescens, Fr. Trunks, rails and stones.

L. albella, Ach. Trunks.

L. tartarea, Ach.; rocks in mountains.—var. frigida, Ach.; rocks in mountains.

L. Cenisia, Fr. Rocks.

L. atra, Ach. Rocks.

L. cinerea, Fr. Rocks.

L. ventosa, Fr. Rocks in mountains.

Rinodia oreina, Ach. Rocks.

R. sophodes, Ach.; trunks and dead wood.—var. confragosa, Nyl.; rocks.—var. exigua, Nyl.; smooth bark.

R. ascociscana, Tuck. Trees and rocks.

R. constans, Nyl. Pine bark.

Pertusaria pertusa, Ach.; trunks.—var. areolata. Fr.; trunks.

P. multipuncta, Nyl. Trees.

P. Wulfenii, DC. Trunks.

P. velata, Nyl. Trunks and dead wood.

P. pustulata. Ach. Trunks.

P. globularis. Ach. On mosses.

Conotrema urceolata, Tuck. Trunks.

Gyalecta cupularis. Schær. Limerocks.

G. lutea, Dicks. Bark of trees.

G. pineti, Fr. Earth.

Urceolaria scruposa, Sommerf. Rocks and trunks.

Thelotrema subtile, Tuck. Trunks.

T. lepadinum. Ach. Trunks.

Stereocaulon tomentosum, Fr. Rocks and stones.

S. paschale, Laur. Rocks and stones.

S. corallinum, Fr. Rocks and stones.

Cladonia turgida, Hoffm. Earth.

C. pyxidata, Fr.; earth.—var. cæspiticea, Flœrk.; trunks.

C. gracilis, var. verticillata, Fr.; earth.—var. elongata. Fr.; earth.

C. fimbriata, Fr. Earth.

C. squamosa, Hoffm. Base of trees.

C. furcata, Flœrk. Earth.

C. rangiferina, Hoffm.; earth.—var. alpestris, Fr.; earth.

C. uncialis, Fr. Earth.

C. cornucopioides, Fr. Earth.

C. cristatella. Tuck. Earth.

Bæomyces roseus. Pers. Sterile clay soil, and sands.

B. Byssoides. var. rupestris, Fr. Sterile sandy soil, etc.

B. æruginosa. Scop. Decaying wood in forests

Biatora Russellii, Tuck. Rocks.

B. ostreata. Kœrb. Charred wood.

B. coarctata. Th. Fr. Calcareous rocks.

ARCHIVES OF SCIENCE.

VOL. I. JULY, 1874. NO. IX.

Observations on Ozone, and its Relation to Disease.—By Hiram A. Cutting, A. M., M. D., State Geologist, Lunenburgh, Vermont.—Delivered at the fifty-third Annual Meeting of the White Mountain Medical Society, January 7th, 1874.—Published by Vote of the Society.—Continued from page 231.

As ozone increases in amount according to elevation for at least two thousand five hundred feet, and some observers say to four thousand feet in inland sections, and as the sea breeze is much more ozoniferous than land breezes, we ought to find the following results: That influenza and all catarrhal diseases of the mucous membranes and lungs, should be more fatal on our hills than in our valleys, especially on our low streams; while cholera and all diseases of that character should be less fatal on high land. We cannot suppose that those diseases can actually be prevented or induced by the small amount of ozone in the atmosphere, but every thing else being equal the predisposition from the same causes would doubtless be accelerated or retarded by the want of, or excess of ozone.

This subject is one of extreme interest both to the physiological and pathological student. A systematic attempt should be made to ascertain if this body, so energetic in its affinities, and so powerful in its actions, possesses when artificially prepared any remedial virtues in diseases; especially those of suboxidation, such as diabetis, the lithic and oxalic acid diatheses, etc., as well as in catarrhal and choleraic diseases. Science does not at present enable us unfortunately to make any positive statement as to what is, and what is not, an unhealthy atmosphere.

The germs of epidemic diseases so much talked of, have never been fully identified, but if they exist, ozone as nature's most energetic disinfectant, should purify, and necessarily must decompose much of the deleterious products of putrefaction, and it would stand to reason as ozone is found at once to destroy rudimentary germs of vegetable life, that if such germs for the production of disease really exist, it would have a strong tendency to destroy them. Reasoning from this, epidemic diseases should be more virulent when ozone is in the minimum amount, but there are contradictory opinions about such being the case.

It is said that variola in Europe has assumed its most malignant type when ozone was in medium amount, but perhaps it was never more persistent and epidemic, or fatal in its results, than it was in our cities last winter, with ozone at minimum. Then again the country is frequently well supplied with ozone when our cities are entirely deficient, and even in Vermont we may have for a time an abundant supply in one part of the state, with but little in another. From this you can see the uncertainty of conclusions based upon anything but absolute observation at the time and place of such epidemic. And then without experience with such tests as are valid, observations are of little worth.

When I commenced observations, after an extensive correspondence with those whom I presumed were authority in the case, at considerable expense I had a tin aspirator made according to the most approved plan, with brass stop-cocks and connections. I always had ozone uniform in amount, and doubtless developed by the combination of metals giving a galvanic current. Deductions from such observations of course would lead to error. Now we have thus far from experiments reasoned out our conclusions. They are of no worth unless sustained by positive fact, and here comes our difficulty; there is great variation in the statements of different observers.

But I will bring forward a few instances where there seems no doubt but what the ozone was properly estimated; as it was so estimated by men of eminence and experience. In 1866 cholera destroyed in England alone ten thousand three hundred persons, and during much of this period of sickness ozone was at its minimum, and for the whole time it was not above three on a scale of ten. Cholera is always found to decrease and ozone to increase with elevation; all admit this. In the countries of Europe, several times a want of ozone has marked cholera epidemics. Morasses and stagnant water are absorbents of ozone, and as a rule it does not exist around them. They are admitted to be unhealthy places, especially in times of dysentery or cholera morbus.

In the English cattle-disease of 1866 almost all the cattle died in low situations and about the cities where there was no ozone; but in the hill country where ozone was four on a scale of ten, few if any died. The Highlands of Scotland were not only free from the cattle-disease but free from cholera, with ozone at four and one half. This was certainly a peculiar coincidence if ozone had nothing to do with it. On the other hand we find that sea breezes of New England are more strongly impregnated than the atmosphere inland, and such sea breezes are a disadvantage to consumptives, and are productive of much catarrh. Diphtheria in Europe and America has always appeared as an epidemic when ozone has been above five in our scale, or at its maximum; and as the amount of ozone has decreased, this disease has not only decreased in fatality but in frequency also.

But as you all have the same access to authors on the subject that I have, I will not bring forward illustrations from them but speak of my own experience. First: that from three to five has shown a general state of health. Second: that below that standard choleraic diseases with dysentery among children have predominated. Third: that above that standard catarrhal and inflammatory diseases have taken precedence, yet during all this period now and then a case would appear in contradiction, or in other words the classification has not been exclusive.

But let us review this period. In 1871, in January and February there was a medium amount of ozone, with now and then sickness from special causes, but nothing that would seem to depart from what would be termed a healthy condition, until March, which was peculiar for the rapid spread of mumps. (Ozone three to four). As the spring opened there were slight catarrhal diseases, following the increase of ozone until the twenty-fifth of May, when there were several severe cases of pneumonia, most of which experienced recurrent attacks. This predisposition to lung disease continued nearly up to the first of July, passing into a period of general health, following in August with dysentery (ozone five) among children, which gradually increased until many adult people were sick with cholera morbus, and at length it assumed a fatal form, carrying off in this section several oldish people, death being preceded by convulsive attacks, general in their nature, about forty-eight hours after the commencement of the disease. (Ozone one).

The last of September this disease assumed a more manageable form and soon disappeared entirely, but in a few days, or by the fifteenth of October a large majority of the people were suffering more or less from catarrhal difficulties, which they denominated cold in the head. (At this time ozone was at nine). This state of disease continued with now and then a case of pneumonia until December, which was a month of general health, (with ozone averaging five). In January 1872 there was much whooping-cough, but with that exception little disease and general good health prevailed. Through the summer there were no typical diseases. (Ozone about medium).

The last of August a few cases of cholera infantum occurred, but none were fatal. There was an occasional case of lung fever in November, with the horse-disease or epizootic all about us, but it did not reach Lunenburgh until the fifteenth of November and was at its hight about the twenty-fifth. (Ozone nine). It seemed to appear in central Vermont first and with greater severity which would accord with ozone here, but it seemed more fatal in our cities which are generally deficient in ozone, yet might have had an excess at that time. Of. this, for the lack of observers there, I am unable to state.

This disease seemed to be almost identical with influenza in man, and in fine almost every person claimed to have a touch of it about the first of December. (Ozone was ten). This passed into a general condition of health with a recurrence of whooping-cough in January. Observers in some sections, especially in Masachusetts, reported a very small amount of ozone for January and February. We all know that variola was epidemic as never before in and around Boston. This accords with observations in Europe which show this disease peculiarly sensitive to ozone (which here was three as an average). The last summer has been a remarkable time of good health, not only in Lunenburgh but I understand it quite generally so through this section.

The last of July and the first half of August was marked by several cases of cholera infantum, followed by pneumonia and catarrhal diseases in October and November, with a remarkable increase of ozone the last of November, about the same even as last year during the horse epidemic, and I expected a reappearance, and I find many horses were affected somewhat.

Since the excess of ozone catarrhal affections have predominated. If these observations do not show any thing definite they certainly show more in favor of our theories than against them, and though in this utilitarian age some may think ozone of little consequence, and ask of what use it is to observe it; yet I trust that most of the medical fraternity will give it due consideration, and unite your efforts with my own in marking the changes in the type of your cases, and communicate to me your results. If you will thus aid me, I will from time to time test for ozone in the locality of special diseases, and we can thus hand in hand by years of observation determine what we can only now see in the possibilities of the future. Should some of those possibilities prove true our observations may be of benefit to mankind.

Ozone may be absorbed in large quantities by cod-liver oil; and may it not thus be of use under some circumstances? Again might it not be worth while in choleraic diseases to try its inhalation, and see if the inflammatory action upon the mucous membranes does not mitigate the prior disease?

Ozonized oil injected in quadrupeds increases the action of the heart; is it possible it might thus in some cases avail something for man? It is now used extensively in Boston to destroy the empyreumatic taste of whiskey. Its action on diluted spirit is to bring into existence the acetic fermentation with great intensity especially if any sugar be present. Can we not gain hints from effects thus produced by which we can make it useful?

Cloud-Formation in the Valley of Lake Champlain.—By John M. Currier, M. D., Burlington, Vermont.

Passing down one of the streets of Burlington, about four o'clock, P. M., on the 1st day of December, 1873, I beheld a beautiful cloud-formation on Lake Champlain. It being a very cold day the vapor as it arose from the lake was congealed only a few feet above the water, and in this state was clearly visible. The lake was completely covered with this frosty vapor, but, here and there, it arose in columns many hundred feet high, and passed into a very dense black stratus cloud that hung ever the lake, and extended as far up and down the valley as the eye could reach. This cloud was borne away to the westward and precipitated on the Adirondacks in the form of snow.

On going to the United States Signal Office in this city, I learned from the officer in charge, Mr. Geo. H. Ellery, the following registry of observations made by him about that hour: Hight of barometer, 30.75 inches; temperature, 3°; relative humidity, 46; direction of the wind, north with a velocity of one mile per hour. On referring to the *Weekly Weather Chronicle* of the War Department for that day I find therein reported: "Clear, cold weather continued in New England and the St. Lawrence valley." Mr. Ellery also informed me that several times he had reported rain at this station when it was clear weather at all other stations outside of the Champlain valley.

There is no doubt about evaporation taking place from all our small streams, ponds, and lakes, but that enough takes place to produce clouds, and a precipitation of rain or snow in any considerable amount, is not so clearly demonstrable as in the Champlain valley, when the meteorological conditions were all so favorable as on the above-mentioned day. Many days during the past year I have observed this dark stratus cloud overhanging the lake, and borne eastward or westward according to the direction of the wind, and precipitated on the Green Mountains or the Adirondacks in the form of rain or snow; many times light rains or cloudy misty weather is observed in the broad valley between.

During the fourteen years I was in practice at Newport, on Lake Memphremagog, I never noticed this cloud-formation. The valley is very shallow, and the area of the lake is small compared with that of Champlain; these conditions favor the floating-away of the vapor as fast as it rises from the lake, with the current of the prevailing wind.

These meteorological conditions modify very materially, not only vegetation, but the character of the prevailing diseases, of the Champlain valley.

Catalogue of the Cryptogamous or Flowerless Plants of Vermont.—By C. C. Frost, Brattleborough, Vermont.— Continued from page 240.

LICHENES.

Biatora chlorantha, Tuck. Pine bark.
B. viridescens, Fr. Earth.
B. decolorans. Fr. Earth on rocks.
B. cinnabarina. Sommerf. Trunks.
B. vernalis, Fr. Trunks, earth and stones.
B. sanguineo-atra. Nyl. Earth and mosses.
B. exigua, Fr. Smooth bark.
B. rivulosa, Fr. Granite rocks.
B. lucida, Fr. Rocks, stones, and dead wood.
B. cyrtella, Ach. Trunks and mosses.
B. mixta, Fr. Bark of trees.
B. atro-purpurea, Mass. Bark of hemlock.
B. trachona, Flot. Granite rocks.

B. hypnophila, Turn. Earth and mosses.

B. milliaria, Fr. Old rails or wood.

B. rubella, Fr.; bark of trees.—var. suffusa, Tuck.; trunks and rocks.—var. Schweinitzii, Tuck.; bark of trees.—var. inundata, Fr.; decaying wood.

Heterothecium pezizoideum, Flot. Fir bark.

H. sanguinarium, Flot. Trunks.

H. tuberculosum, Flot., var. porphyrites, Tuck. Mansfield Mountain.

Lecidea contigua, Fr.; rocks and stones.—var. albo-cœrulescens, Fr.; rocks and stones.

L. fusco-atra, Fr. Rocks and stones.

L. dolosa, Wahl. Bark of pines.

L. spilota, Fr. Trap and other rocks.

L. melancheima, Tuck. Trunks and rails.

Buellia epigea, Pers. Earth.

B. lactea, Mass. Granitic and other rocks.

B. lepidastra, Tuck. Granitic rocks.

B. atro-alba, Flot. Granitic and other rocks.

B. albo-atra, Th. Fr. Trunks.

B. coracina, Th. Fr. Rocks Mansfield Mountain.

B. parasema, Ach. Trunks and dead wood.

B. dialyta, Nyl. Pines and hemlocks.

B. myriocarpa, DC. Granitic rocks.

B. Elizæ, Tuck. Pine bark.

B. saxatilis, Schær. Rocks.

B. petrea, Flot.; rocks.—var. Montagnei, Tuck.; rocks.

B. geographica, Schær. Rocks.

Lecanactis premnea, var. chloroconia, Tuck. Trunks.

Opegrapha varia, Fr. Trunks.

O. atra, Nyl. Trunks.

Graphis scripta, Ach. Bark of trees.

G. dendritica, Ach. Trunks.

Arthronia lecidella, Nyl. Trees and shrubs.

A. spectabilis, Flot. Various barks.

A. astroidea, Ach. Bark.

Mycoporum pycnocarpum, Nyl. Various barks.

Acolium tigillare, De Not. Trunks and old rails.

A. viridulum, De Not. Red pines.

Calicium trichiale, Ach. Rough bark of trees.

C. brunneolum, Ach. Decaying wood.

C. chrysocephalum, Ach. Bark of hemlocks, etc.

C. curtum, Turn. and Borr. Old wood.

C. subtile, Fr. Decaying wood.

C. trachelinum, Ach. Decaying wood and trunks.

C. phœcocephalum, Turn. Old wood.

C. turbinatum, Pers. Crust of Pertusaria pertusa.

C. Curtisii, Tuck. Bark of Rhus.

Coniocybe furfuracea, Fr, Earth, dead bark, swamps.

C. pallida, Fr. Bark of Ash and Oak.

Endocarpon miniatum, var. complicatum, Schær.; wet and dry rocks.—var. Muhlenbergii, Nyl.; rocks near streams.—var. fulvo-fuscum, Tuck.; rocks.—var. aquaticum, Schær.; wet rocks.

E. pusillum, Hedw. Earth.

E. rufescens, Ach. Earth.

Staurothele umbrina, Wahl. Granite rocks.

S. diffractella, Nyl. Schistose rocks.

Trypethelium virens, Tuck. Trunks.

Sagedia oxyspora, Ach. On bark of Birch and Oak.

S. Cestrensis, Tuck. Bark of the Beech.

Verrucaria epigæ, Ach. Naked earth.

V. nigrescens, Wahl. Rocks and limestones.

V. virens, Nyl. Rocks.

V. rupestris, Schrad. Limerocks.

V. muralis, Ach. Old mortar and limerocks.

Pyrenula punctiformis, Ach. Various barks.

P. gemmata, Ach. Trunks.

P. hyalospora, Nyl. Various trunks.

P. leucoplaca. Wahl. Trunks.

P. nitida, Ach. On smooth bark.

* * *

Catalogue of the Flowering Plants of Vermont.—By Professor George H. Perkins, Ph. D.—Continued from page 234.

Order.—SAXIFRAGACEÆ.

Parnassia Caroliniana, Michx. Wet places; not common; August.

Saxifraga oppositifolia. L. *Mountain Saxifrage.* Willoughby Lake, A. Wood: May.

S. aizoides, L. *Yellow Saxifrage.* Willoughby Lake, A. Wood; on high rocks.

S. Virginiensis, Michx. *Early White Saxifrage.* Very common; rocky hillsides and in open woods; last of April.

S. Pennsylvanica, L.. *Swamp Saxifrage.* Swamps and bogs; not very common; June.

Mitella diphylla, L. *Mitre-wort.* Very abundant on rocky hillsides and borders of groves and about large rocks in fields; May.

M. nuda, L. Rare; woods on borders of swamps and shaded bogs; June.

Tiarella cordifolia, L. *Tiarella.* Very abundant on moist banks; last of May.

Chrysosplenium Americanum, Schw. *Water Mat.* Not uncommon in brooks and boggy places; May.

Order—CRASSULACEÆ.

PENTHORUM SEDOIDES, L. *Stone Crop.* Common along ditches and in moist places; July.

SEDUM *TELEPHIUM, L. *Live-for-ever.* Common in many places in stony ground where it has escaped from cultivation and become naturalized.

Order—HAMAMELACEÆ.

HAMAMELIS VIRGINICA, L. *Witch Hazel.* Common in damp woods; October.

NOTICE TO SUBSCRIBERS.—With this number closes Volume One of this Journal; delinquent subscribers are requested to forward their remittances immediately, not only for the past, but for the succeeding volume.

CONTENTS.

Character and Customs of the Pawnees, by T. E. Ranney. 1

Qualitative Analysis of the Mineral Springs of Essex County, Vermont. By H. A. Cutting. 17, 149

Indian History of Northern Vermont. By Wm. W. Grout. 21

Meteorological Register, kept by J. M. Currier. 26

New Mounting for Microscopic Objects. By H. A. Cutting. 43

Double Maple Tree. 45

Transactions of the Orleans County Society of Natural Sciences. 49, 94, 120, 158, 179, 198

Notes on the Flora of Vermont. By Geo. H. Perkins. 65

Geology and Mineralogy of Orleans County. By S. R. Hall. 71

Catalogue of the Cryptogamia of Vermont. By C. C. Frost. 78, 111, 152, 192, 234, 249

Dust Storm in Vermont. By H. A. Cutting. 81

Insect Fauna of Camel's Hump. By P. S. Sprague. 85

Scientific Intelligence. 89, 117, 15

Bibliographical Notices. 47, 90, 119, 156, 175, 205, 224

Observations on the Beaver of Orleans County. By Isaac Parker. 97

Catalogue of, and Observations on the Birds of Vermont. By Daniel Goodhue. 102, 171

Natural History Papers. By H. A. Cutting. 105

Birds, in their Relation to Agriculture. By Geo. H. Perkins. 130

Catalogue of the Flowering Plants of Vermont. By Geo. H. Perkins. 161, 181, 215, 231, 252

Botanical Notes. 167

Notes on Nostochineæ. By H. A. Cutting. 190

Meteorological Observations. By H. A. Cutting. 196

Direction of the Wind in Local Thunder Storms. By H. A. Cutting. 209

Notes on the Winooski Marble. By Geo. H. Perkins. 218

Observations on Ozone, and its Relation to Disease. By H. A. Cutting. 226, 242

Cloud-Formation in the Valley of Lake Champlain. By J. M. Currier. 247

New York Botanical Garden Library
3 5185 00257 8290